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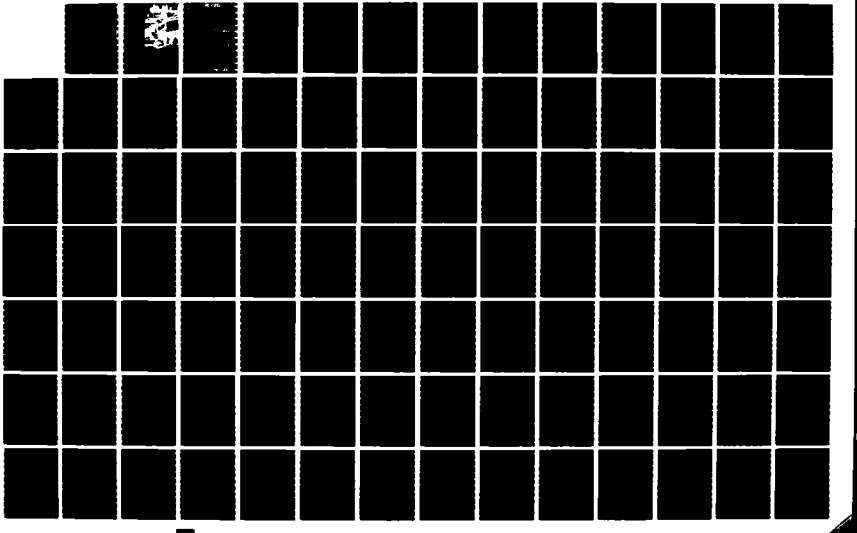

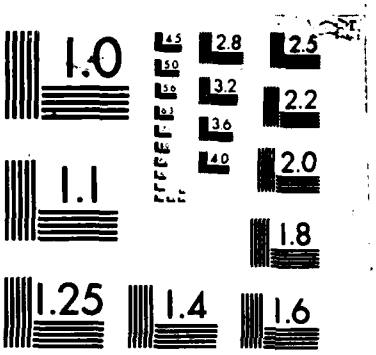

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

ALASKA
EARTHQUAKE
ANALYSIS
CENTER

GEOPHYSICAL INSTITUTE

PHOTO: TURNAGAIN HEIGHTS, ANCHORAGE, 1964

UNIVERSITY OF ALASKA

FAIRBANKS, ALASKA

AD-A176 804

FINAL TECHNICAL REPORT

Contract No. F49620-81-C-0091

1 July 1981 - 30 September 1984

prepared by

Charles R. Wilson and Bruce N. McKibben

for

Air Force Office of Scientific Research NP
Building 410, Bolling Air Force Base
Washington, D. C. 20332

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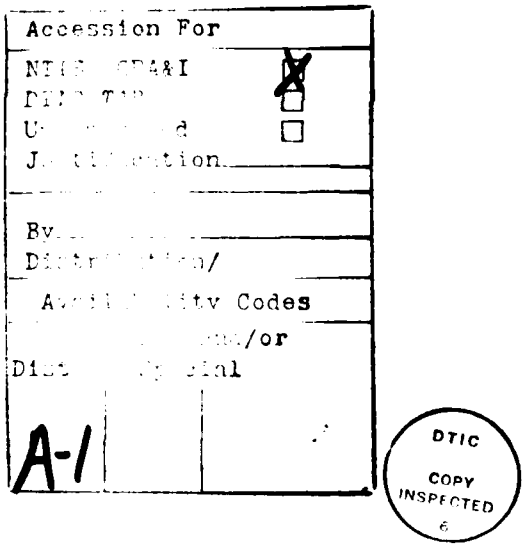

INTRODUCTION

In order to monitor atmospheric infrasonic waves in the passband from 0.1 to 0.01 Hz a digital infrasonic detection system was installed in Antarctica on the Ross Ice Shelf, (at 77° 44' 43" S, 167° 35' 15" E) near McMurdo Station on McMurdo Sound.

An array of seven infrasonic microphones subtending an area of about 35 square kilometers was operated in Windless Bight with power supplied for the array electronics by a radioisotope thermoelectric (RTG) generator on loan from the Navy. The analogue microphone data was telemetered at VHF a distance of 14 miles to McMurdo station where the infrasonic observatory building was located. The infrasonic data were digitized and subjected to on-line real-time analysis to detect traveling infrasonic waves with periods from 10 to 100 seconds. The raw data as well as the signal-search analysis results were all recorded on digital magnetic tape for archiving and subsequent additional analysis of special events and suspected signal times.

In Antarctica the equipment was operated by a wintering-over electronic technician who also performed signal search and analysis upon request. Each Antarctic summer the seven microphones were dug up from the winter's accumulation of snow, placed on the new snow surface and recalibrated. During the years of operation of the infrasonic system in Windless Bight it was also necessary to dig up the RTG building to prevent its being lost under drifting snows.

During the period of operation of the Antarctic infrasonic observatory, hundreds of infrasonic signals were detected in association with many natural sources such as the aurora australis, marine storm sea-air interactions, volcanic eruptions, mountain generated lee-wave effects, large meteors and auroral electrojet supersonic motions. Weekly summary sheets of all detected

infrasonic signals were sent by telegram from Antarctica during the winter night to the Geophysical Institute for forwarding to the Air Force Office of Scientific Research.

All the digital infrasonic data tapes are archived at the Geophysical Institute at the University of Alaska in Fairbanks, Alaska.

A summary of the reports written during the period of the contract is given in the next section. A complete technical description of the infrasonic equipment, its hardware and software components, its operation and calibration techniques and the real-time signal search programs are given by engineer Bruce N. McKibben in the final section of this report.

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Progress Report: GIR 82-1

October 1, 1981 - April 30, 1982

Antarctic Digital Infrasonic System Upgrade

A description is given by B. David Spell in the first section of this report of the upgraded digital data acquisition and analysis system that has been improved in order to provide on-line pure-state filtering of the infrasonic microphone array data. The implementation of Dr. John V. Olson's pure-state filtering technique was done in the new system by Mr. Spell in software, freeing our second Digital PDP 11/03 microprocessor for use in off-line analysis by the winter-over operator of selected signals.

In the second section Dr. Olson describes the software he has provided for off-line analysis including: Beam-Steer/Detection Algorithms, Data adaptive filters, Array diagnostic routines, and Time series analysis codes.

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The data handling procedures are described in the third section using as an example the infrasonic waves from the 29 March 1982 eruption of El Chichonal Volcano in Mexico as detected by our digital system in Antarctica.

A brief report is provided in the last section of the enhancement in the number of signals detected as a result of on-line pure state filtering.

A listing of all the software used in the operating system and for off-line analysis is given in the appendix.

Progress Report: GIR 82-2

May 24, 1982

Windless Bight Wind Noise Analysis; and 15 Dec. 1980, 27 Feb. 1981, 6 March 1981 Infrasonic Signal Search

It was requested by AFOSR/NP that an analysis be made of the wind noise levels at the Windless Bight infrasonics array using the digital data from 1981. This analysis of the RMS wind noise levels, as discussed in section A of this report, has shown that in the F array passband (10 to 100 sec periods) the yearly average RMS wind noise level is 1.07 microbars while in the T array passband (1 to 10 sec periods) the RMS yearly average is 0.30 microbars for local wind noise. More than 14.5 million pressure values at one second intervals were averaged in obtaining these RMS values. The very low values of average RMS wind noise level at Windless Bight confirm that it is an excellent site for the Antarctic infrasonics observatory.

Sections B and C of this report are in response to a request by AFOSR/NP for a detailed analysis of an infrasonic signal observed on 15 December 1980 and for a search for possible signals at Windless Bight on 28 February 1981 and 6 March 1981. The on-line time-domain analysis of these events is described in section B while the off-line frequency-domain analysis is discussed in section C.

It was found that the 15 December 1980 event produced an excellent signal while no discernible signal was observed from either the February or March 1981 events.

Final Progress Report GIR 82-3

1 October 1981 to 30 Sept. 1982

Antarctic Atmospheric Infrasound

The infrasonic observatory at Windless Bight, Antarctica was operated continuusly during the period of 1 October 1981 to 30 September 1982 as covered by this report. The infrasonic microphone outputs from a four sensor long period (10 to 100 sec) array and a three sensor short period (1 to 10 sec) array were digitized (at 1 Hz and 4 Hz respectively), recorded and analyzed in real-time by the digital data acquisition and analysis system as described by Spell et al., in our progress report GIR 82-1 entitled: Antarctic Digital Infrasonic System Upgrade". Analogue chart and slow speed magnetic tape data were also recorded for backup purposes.

The digital magnetic tapes for the period of this report are archived at the Geophysical Institute of the University of Alaska beginning with tape M81-35, 2319 - 24 September, 1981 to 1228Z - 1 October 1981 to tape M81-51, 0517Z - 26 December 1981 to 0807Z - 1 January 1982 to 2036Z - 7 January 1982 to tape M82-47, 0328 26 September 1982 to 0155Z 2 October 1982. Infrasonic summary reports of all signals with correlation coefficient greater than 0.50 have been sent from Antarctica to the Geophysical Institute by telex for each digital tape beginning with M82-2 0459Z 4 February 1982 to 0134Z 10 February 1982. Copies of these infrasonic signal reports for each digital tape have been sent to Mr. William J. Best at AFSR/NP at Bolling Air Force Base.

After initial electrical noise interference problems were corrected at the equipment building in McMurdo station in early February 1982 there was no significant data loss for the infrasonic system. During the winter night the Aurora microphone oscillator failed out in Windless Bight. The winter-over operator, Bruce McKibben, made a trip out to the microphone array by tracked vehicle on July 17 to replace the faulty oscillator and recalibrated the aurora microphone.

During the winter night period in Antarctica, Bruce McKibben, adapted the off-line analysis and filtering software that had been developed at the Geophysical Institute on a large virtual memory computer (the VAX 1778) for use on a much smaller and slower computer the PDP 11/03 that is used in our system at McMurdo station. This off-line analysis software is reproduced in section III of this report.

Training of the new winter-over operator, Kathleen Driscoll, began in July 1982 at the Geophysical Institute and continued in Antarctica under the guidance of Mr. McKibben on site through November 17th when he left McMurdo station for home. Kathleen Driscoll is an electronic technician with 12 years experience at the University of Alaska and at remote sites in the Canadian arctic.

In Section 1 of this report, Jefferson Collier, a graduate student working on the analysis of Antarctic infrasonic data, described the results of the analysis of microbarom data from the short period microphone array at Windless Bight for all 1981 data. Mr. Collier is supported by NSF/DPP under grant number DPP 8120794 for the analysis of Antarctic microbarom data.

In Section II, Dr. John Olson describes the results of his research on infrasonic data analysis as presented at the European Geophysical Society meeting at Leeds, England in August 1982 at a special symposium on the

"Filtering Analysis in Geophysics" that Dr. Olson was asked to chair because of his extensive contributions in this field. His paper as herein reproduced is titled: "Signal Detection in Scalar Arrays" Application of Adaptive, Pure-State Filters to Infrasonic Array Data".

Logistical support for the Antarctic infrasonics program has been given by the Division of Polar Programs of National Science Foundation under a three year grant number DPP 81-21669.

Final Progress Report GIR 83-1

May 1983

Antarctic Infrasonic System Software

All the computer programs used in the Antarctic infrasonic digital system are described and listed in this report for the data acquisition, data retrieval and off-line analysis sub systems.

Final Progress Report GIR 83-2

June 1983

Report on Search for an Infrasonic Signal at

Windless Bight, Antarctica from May 11, 1983

Event at 14°S 1.5°W

A request was received from AFOSR to search for a signal from 14°S, 1.5°W at 1112 Z on May 11, 1983 in the Antarctic infrasonic wave data from Windless Bight station. In spite of the low wind noise level no signal was found in the appropriate time interval from the azimuth of the expected source.

This report describes the search procedure and signal analysis in both the time and frequency domains for the data set. A comparison signal from the eruption of Galunggung volcano in Java as detected on a very windy day at Windless Bight is given to illustrate the identification process.

All the programs referred to in this report (STATS, SCAN, FKDET, SPCTRM) are described in our report GIR 83-1, May 1983, titled Antarctic Infrasonic System Software, by Bruce N. McKibben.

Final Progress Report GIR 83-3

December 1983

Annual Report: Antarctic Atmospheric Observations

The infrasonic observatory at Windless Bight, Antarctica was operated continuously during the period of 1 October 1982 to 30 September 1983 as covered by this report. The infrasonic microphone outputs from a four sensor long period (10 to 100 sec) array and a three sensor short period (1 to 10 sec) array were digitized (at 1 Hz and 4 Hz respectively), recorded and analyzed in real-time by the digital data acquisition and analysis system as described by Spell et al., in our progress report GIR 82-1 entitled: Antarctic Digital Infrasonic System Upgrade". Analogue chart and slow speed magnetic tape data were also recorded for backup purposes.

The digital magnetic tapes for the period of this report are archived at the Geophysical Institute of the University of Alaska beginning with magnetic tape MT82-47 (26 September - 2 October 1982) and ending with tape MT83-51 (27 September - 2 October 1983). Infrasonic summary reports of all signals with correlation coefficients greater than 0.50 have been sent from Antarctica to the Geophysical Institute by telex for each digital tape. Copies of these

infrasonic signal reports for each digital tape have been sent to Mr. William J. Best at AFOSR/NP at Bolling Air Force Base. There was no significant data loss for the period covered by this report.

During the austral summer field season a new survey of the 7 microphone array in Windless Bight was made using an electronic distance meter. The updated coordinates of the microphones are given in the following figure and table for January 1983. The error in closure of the 20 kilometer traverse in the survey was only 2.0 cm so the accuracy of the site determination is within one meter. The geographical coordinates of the RTG site are, Latitude: 77° 44' 43.4 S, Longitude 167° 35' 15.2 E.

Kathleen Driscoll, an electronic technician from the Geophysical Institute, has wintered-over at McMurdo Station, Antarctica, operating the infrasonic equipment from the period November 1982 to the present time. She has done an excellent job of routing operation of the system, maintenance of the microphones and telemetry in the field sites and of off-line data analysis in response to special requests from AFOSR.

In Section I of this report, John V. Olson, describes the detection and filtering of the signals in scalar arrays. He reviews several techniques used in the University of Alaska Infrasonic Program to analyze digital data from an array of microphones. All of the techniques described are based upon a simple and compact state-vector representation of signals from arrays of sensors. The construction of state-vectors and the spectral matrix is discussed for arbitrary signals. These ideas lead naturally to a frequency domain detection algorithm which is simple to implement. The detection scheme is shown to be equivalent to the traditional "f-k" analysis. Finally, he shows the application of the state-detectors in the frequency domain to the filtering of data. Filters can easily be constructed which are sensitive to the azimuth of certain signal arrivals and which reject signals from other directions.

In Section II, Dr. Olson, gives estimates of the energy release of recent volcanic eruptions using Windless Bight infrasonic data as an example of the type of analysis that is possible with the Antarctic digital infrasonic data.

In Section III, examples are given from the 1982-83 Antarctic infrasonic data of the off-line analysis of natural infrasonic signals observed at Windless Bight. The examples shown in this section of power spectra and slowness-azimuth diagrams for microbaroms, mountain associated infrasonic waves and auroral infrasonic waves were all analyzed in Antarctica by Kathleen Driscoll and sent by telex to the University as examples of what further analysis can be done for special events in addition to the time domain detection that is done routinely.

In Section IV of this report, B. David Spell describes the installation of a digital data acquisition and analysis system on the Waramunga infrasonic array near Tennant Creek, Australia. In November 1983, Bruce McKibben, on the way to winter-over in Antarctica for his second season at McMurdo Station, visited the Waramunga infrasonic array to install filter amplifiers in the system to make the pass band characteristics of the Antarctic and Australian arrays identical. On 18 November 1983, the Waramunga array with the standard N-6 (1 to 10 sec) and N-7 (10-100 sec) pass band filters became operational.

Final Progress Report GIR 84-1

April 1984

Estimation of the Energy of Atmospheric Explosions

Using the Infrasonic Array at Windless Bight, Antarctica

We developed in this report a method by which the energies of atmospheric explosions may be estimated using data collected with the infrasonic array

located at Windless Bight, Antarctica. Because of the bandpass characteristics of the data acquisition system, previous techniques for estimating explosion energies were judged to be not suitable for our applications. Instead, a method was developed which incorporates what is known about global acoustic-gravity wave propagation and observations of other known atmospheric explosions. Through application of pure state filtering techniques to geophysical data, we believe that explosions equivalent to several tens of kilotons of TNT at ranges of a few thousand km should be detectable.

Table of Contents

Chapter 1

INTRODUCTION TO INFRASONICS

Infrasound is sound with a frequency that is below the range of human hearing. In all other respects it is the same as audible sound: it travels at the same velocity, it requires a medium for propogation (such as air), and it is made up of periodic pressure variations in the propogation medium. At Windless Bight there are two infrasonic arrays which are designed to detect signals from two passbands. The large array (also known as the "N-7" or "F" array) consists of four microphones, each spaced about four miles apart from one another. This array will detect signals with periods from 7 to 70 seconds. The small array (also known as the "N-6" or "T" array) also consists of four microphones, however these have a spacing of about 700 meters. This array will detect signals in the 1 to 10 second period passband. Infrasound can be detected at other frequencies (such as the work done by Dr. Christie at Tennant Creek, Australia) but such signals are not within the scope of the Windless Bight program.

There are five types of signals which are commonly detected by the Windless Bight system. These are microbaroms, auroral infrasonic waves, mountain associated infrasound, Mount Erebus eruptive events, and signals related to large atmospheric disturbances. Each of these are described below.

Microbaroms are generated by marine storms (generally low pressure systems) which will cause a large area of the sea surface to oscillate in standing waves with a period of about 14 seconds. This in turn creates an atmospheric oscillation which travels as a sound wave with a period of about 7 seconds. At Windless Bight, microbarom activity is commonly detected from the Ross Sea, the Bellingshausen Sea, the Weddell Sea, and the South Indian Ocean. Microbarom activity is detected by the N-6 array.

Auroral Infrasonic Waves are shock (or bow) waves created by the supersonic motion of an auroral electrojet. AIW have been studied in the northern hemisphere for several years. In all of the northern hemisphere studies, AIW have been found to occur only when the electrojet is moving toward the equator. The Windless Bight Infrasonic Array was originally created to further study this asymmetry. Windless Bight has the highest geomagnetic latitude of any infrasonic observatory, and is the only such observatory in the south polar region. AIW are detected by the N-7 array.

Mountain Associated Infrasound is a low-level and fairly continuous sound that is produced by jet stream interaction with mountains. This type of infrasound is most commonly seen at Windless Bight from three sources: azimuths 140 degrees, 230 degrees, and 340 degrees. It is not known where

these sources of infrasound are located. MAI is detected by the N-7 array.

Mount Erebus is an active volcano located only fifteen miles from the Windless Bight array. Frequent mini-eruptions from the lava lake at the summit of the mountain create infrasonic pulses with periods in the range of 3 to 5 seconds. Usually these events are small in amplitude, but are easily discernable from microbaroms by their short period and good resolution of azimuth and velocity estimates. During times of increased volcanic activity, events can exceed the dynamic range of the sensor/discriminator system. These events are detected by the N-6 array.

Signals related to atmospheric disturbances are typically large explosive eruptions of volcanoes. Major eruptions will produce infrasound of such intensity that it can be detected from any point on the globe. Such signals can last for several hours and will contain a wide spectrum of frequency components. The eruptions of Mount Saint Helens (Washington, USA) in May 1980, and El Chichon (Mexico) in April 1982 are two such events that were recorded by the Windless Bight system.

Infrasonic signals are detected using an array of three or more "microphones." An infrasonic microphone is actually a microbarometer, but is designed in such a way that any changes in pressure that last for longer than a few minutes will be ignored. Wind is detectable with such a microphone, but is undesired noise in terms of infrasonic signal detection, so it is minimized by using an acoustic filter (a variation of the Daniels space filter). At Windless Bight, this filter is simply a 300 foot long pipe with a 0.074 inch hole drilled in it every 5 feet. Differing pressures at adjacent holes will tend to cancel one another, thus pressure variations with wavelengths of less than 600 feet will be filtered.

As the pressure varies, a diaphragm in the sensor varies its capacitance, creating a frequency modulated audio signal which represents the pressure variations. This audio tone is transmitted from Windless Bight to the Infrasonics Lab at McMurdo Station where the pressure information is demodulated and recorded.

The signal traces from the pressure variations are then compared to determine the correlation between different sensors in an array, and the arrival time lag (between sensors) of each signal. Historically, this was done by laying chart records on top of one another on a light table. However, the Windless Bight system uses a computer to perform this analysis. If the correlation between sensors is high, a signal is presumed to exist. Time lag information is used to determine the trace velocity and azimuth of arrival. The data is filtered using a frequency domain data-adaptive polarization filtering technique. The time domain analysis is then repeated for the filtered data. The unfiltered data and these analysis results are recorded on magnetic computer tape.

The Infrasonics Lab also houses a second computer which is used for further analysis of signals of interest. A fairly comprehensive software library is maintained for data analysis, data transmission and additional software development.

Chapter 2

Hardware Overview

The Windless Bight Infrasonic Observatory is a complete system consisting of two remote infrasonic sensor arrays and a support laboratory staffed by a full time technician. The large (N-7) sensor array includes four sensor stations which are named RTG, Erebus, Terror and Ross. These sensors are spaced about 4 to 6 kilometers from one another. The small (N-6) array uses the RTG station, and three additional stations which are named Aurora, Vee and Nova. These sensors have an inter-station spacing of about 1000 meters. The two sensor arrays are located in Windless Bight, a portion of the Ross Ice Shelf near the southern shores of Ross Island. This is about 15 miles from Scott Base, at the southern end of Hut Point Peninsula. A map of the sensor locations is shown in figure 1. The Infrasonics Lab is located halfway between Scott Base and McMurdo Station, and houses the data collection and analysis systems, supplies, repair parts and so forth.

The Windless Bight Infrasonic System consists of three major subsystems: the remote sensors with their power supply and transmitters, the analogue recording system with its receivers and demodulators, and the digital data acquisition and analysis system with its computers and associated peripherals. Block diagrams for each of these subsystems are shown in figures 2, 3 and 4.

2.1 Remote Sensors

The sensor itself consists of an acoustic filter attached to a microphone can. The filter is a 300 foot long, 2 inch diameter PVC pipe with a 0.074 inch hole every 5 feet along the length of the pipe. Air enters the filter pipe through the small holes, as the ends of the pipe are sealed. A center tap on the pipe directs the air through a short hose to the microphone can. Air entering the can first passes through a valve in the calibrator box to the microphone capsule. This calibrator box consists of an electrically driven valve to close the line from the hose, and a small pump to differentially pump air into the microphone and the backing volume.

The electronic part of the sensor is the microphone capsule and the oscillator. The microphone capsule, a capacitive diaphragm, is normally connected between the input air hose and the backing volume. An air pressure difference between these two air volumes will cause the diaphragm to move,

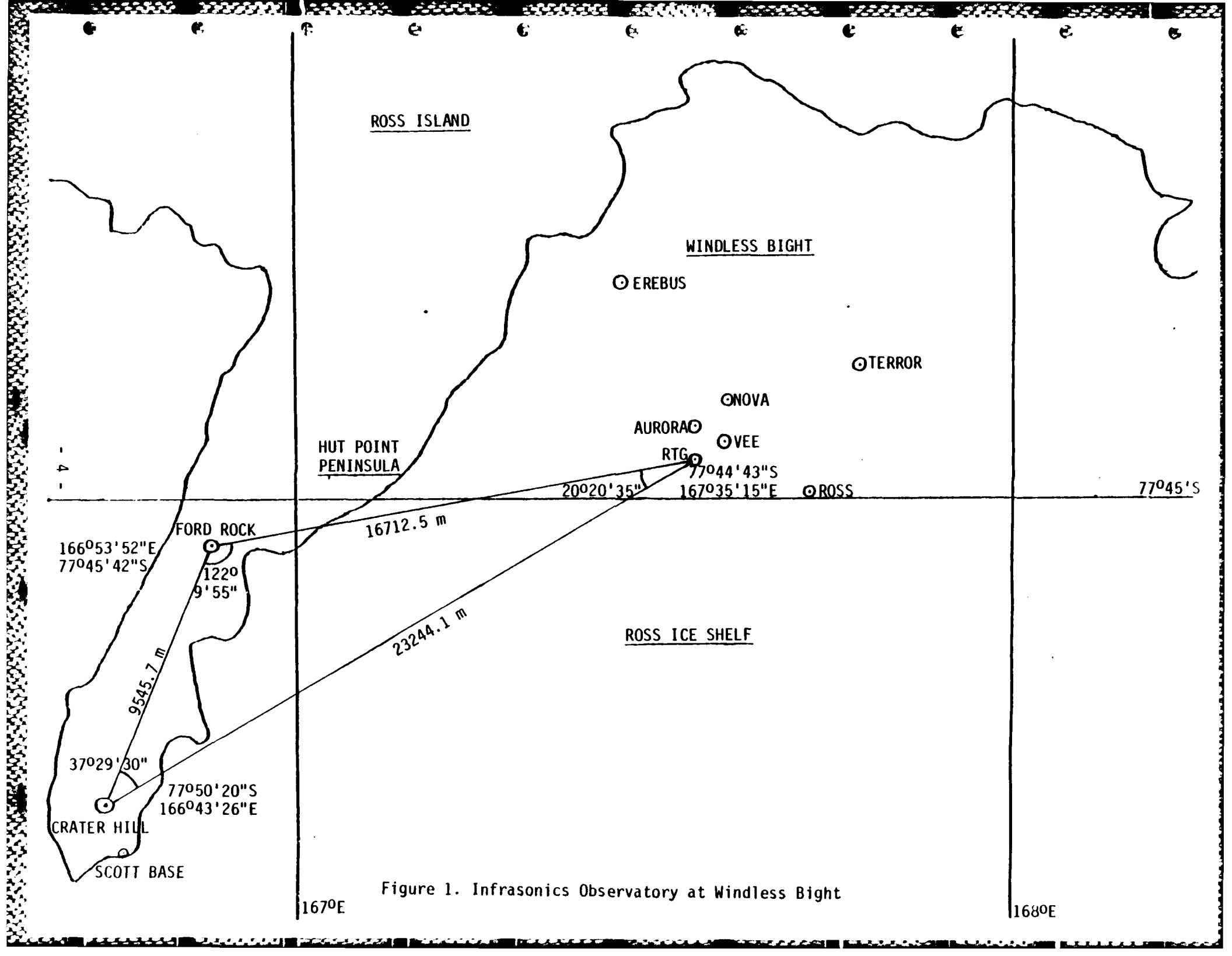
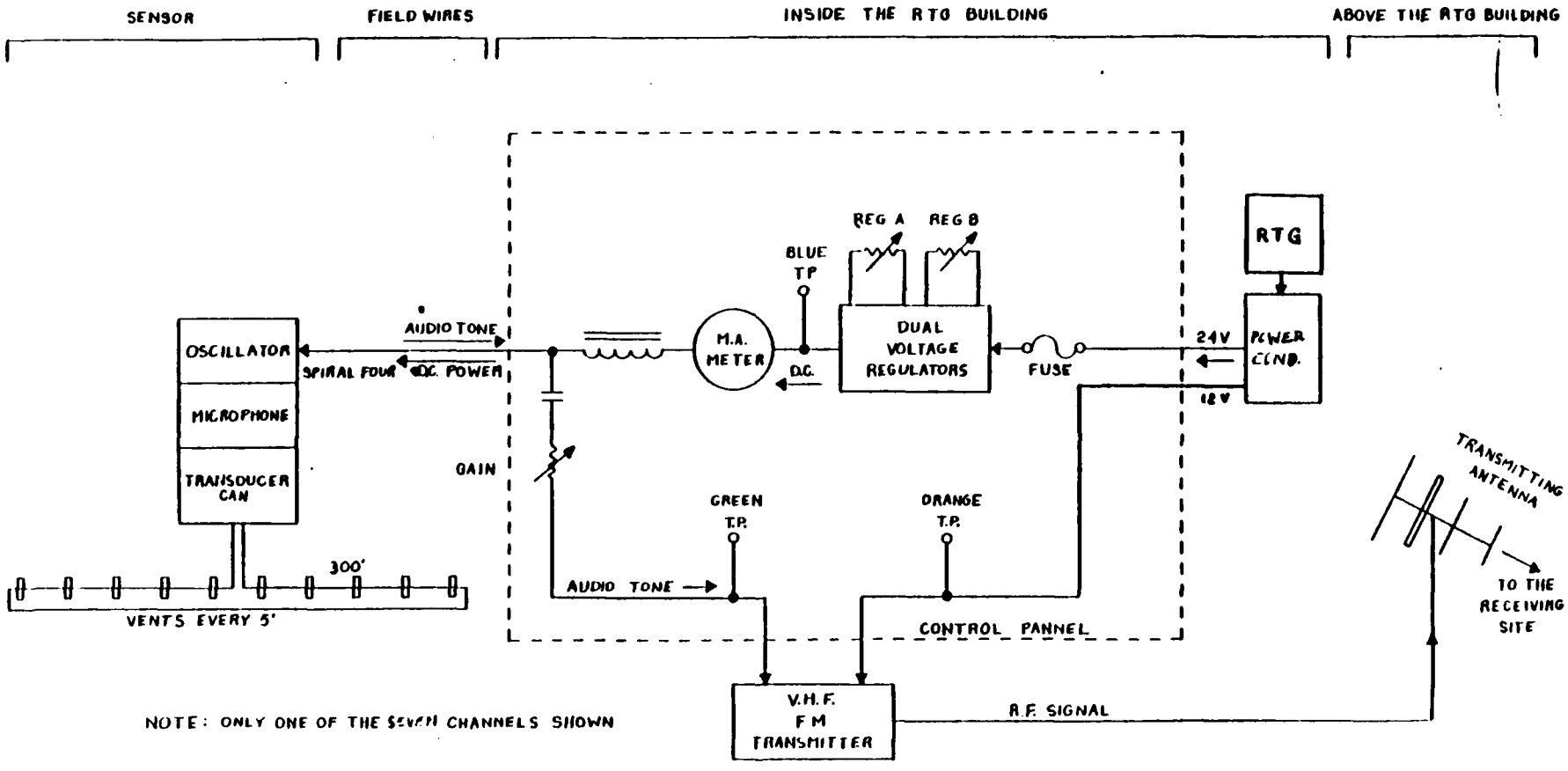


Figure 1. Infrasonics Observatory at Windless Bight



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BLOCK DIAGRAM OF INFRASONIC EQUIPMENT IN WINDLESS BIGHT, ANTARCTICA		
GEOPHYSICAL INSTITUTE UNIVERSITY OF ALASKA FAIRBANKS, ALASKA		
DESIGN BY D.L. OSBORNE	DATE APRIL 80	
DRAWN BY HELEN HIGGINS	DRAWING NO	
CHECK BY	5140-80-2	

Figure 2. Remote Site Block Diagram

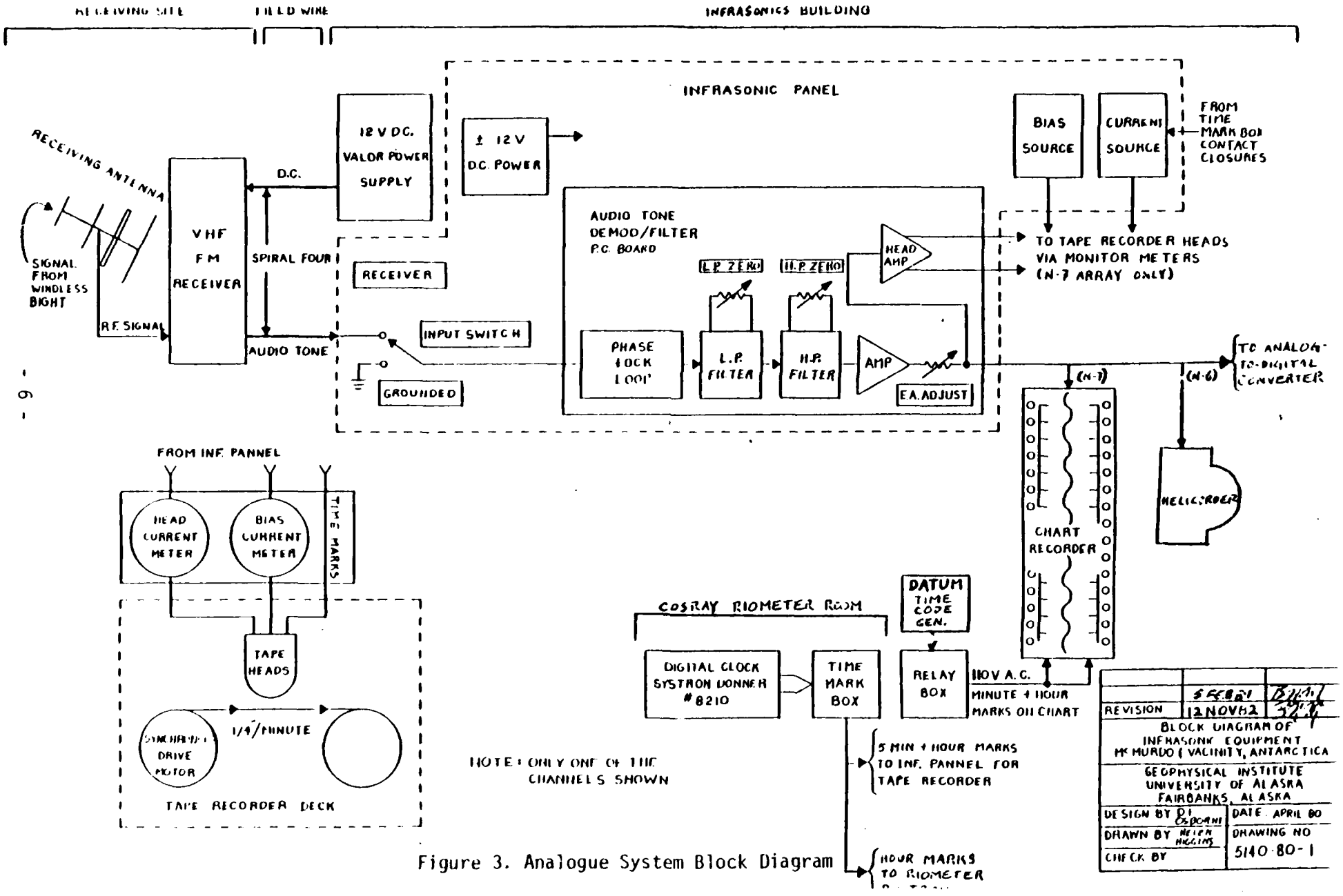


Figure 3. Analogue System Block Diagram

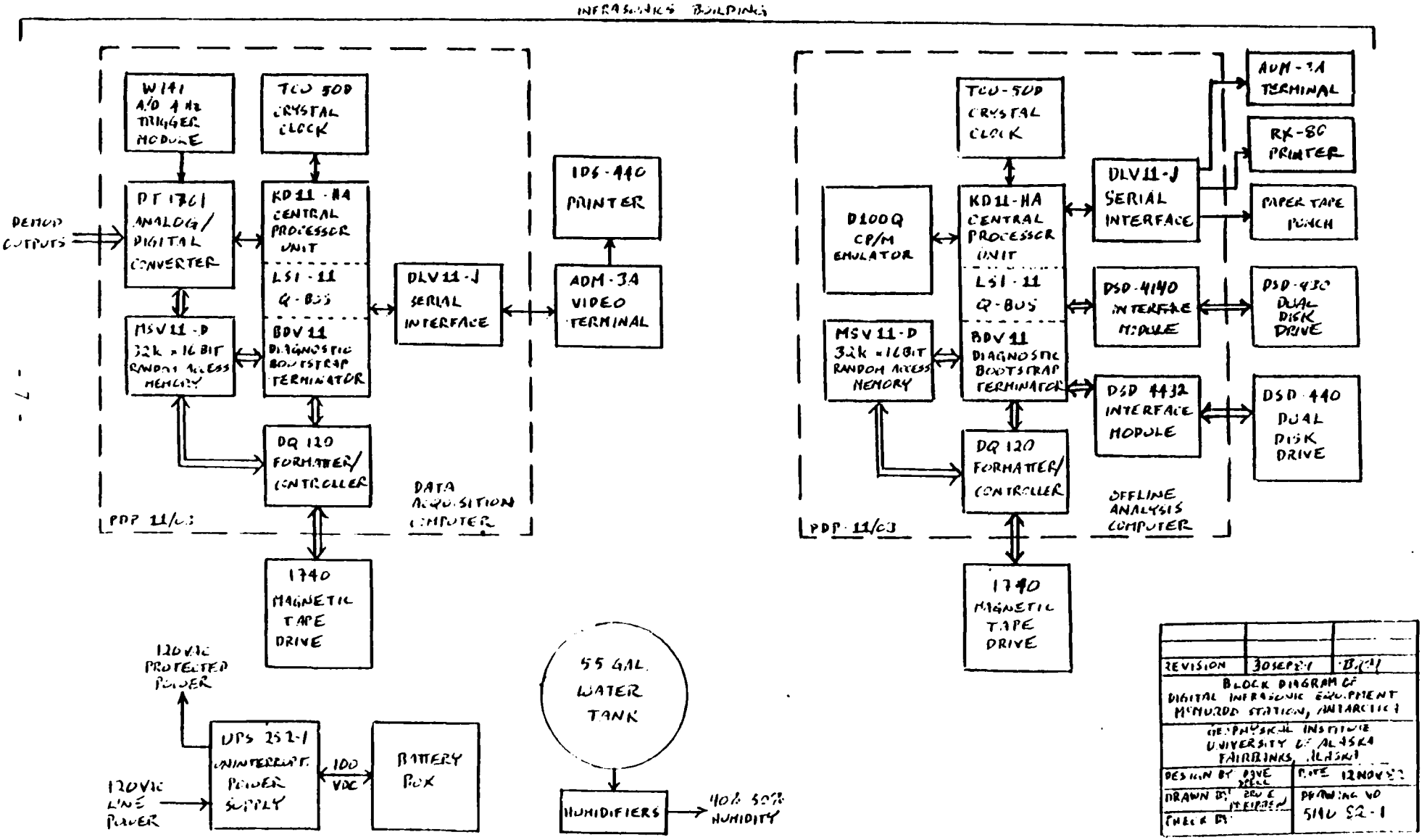


Figure 4. Digital System Block Diagram

thereby changing the capacitance of the microphone capsule. The normal capacitance is about 100 picofarads. A Wein Bridge oscillator is connected to the capsule, and the oscillator frequency is inversely controlled by the capacitance. The output of the oscillator is a frequency modulated audio tone. A higher outside air pressure than in the backing volume raises the frequency above its normal frequency (nominally 1500 hertz). A slow leak is connected across the diaphragm to compensate for long term changes in pressure.

The 12 volt DC power for the oscillator and the oscillator's audio output share the same pair of conductors. For redundancy, each conductor is actually two wires. All four wires are in a common cable of the type CX1065/6, commonly known as "spiral four." There is a run of spiral four from each sensor to the RTG Hut which contains the power supply and the transmitters.

The source of electric power for the seven sensors is a Radioisotope Thermoelectric Generator (RTG). This RTG is a model LCG-25C, serial number RTG-006, built by a division of the Martin Marietta Corporation (which no longer exists). It is on loan from the US Naval Facilities Engineering Command Nuclear Engineering Division. The RTG was originally fueled on 01 December 1967, and had an output powerof 38 watts. Output power decreases by about 1.35 watts per year. On 01 December 1980 the output power was 21 watts. Under the current configuration of the electronics at Windless Bight, the RTG will supply sufficient power until January 1988, or possibly January 1989. A 75 ohm, 5 watt resistor is connected to the system to consume extra power. This should be changed to a 150 ohm, 2 watt resistor in January 1986. The 150 ohm resistor should be removed in January 1987.

The output voltage of the RTG is nominally 2.43 volts. A DC to DC power conditioner is used to convert this to 12 volt and 24 volt supplies to power the system electronics. The power conditioner is model Sentinel 25 PCU-001-5004, serial number SC1014 and was built by Isotopes, Nuclear Systems Division, Teledyne Corporation. This may be the only such power conditioner in existence. A complete set of spare components for the power conditioner is stored in the Infrasonics Lab.

The spiral four cables from the seven sensors are connected to the electronics panel in the RTG Hut. The control panel has eight identical circuits; one for each sensor and one spare. For redundancy, there are two variable voltage regulators for each sensor which are adjusted to supply 19 milliamperes to the oscillator. This results in 12 volts across the oscillator. Due to line losses in the spiral four cable, the voltage at the hut may be more than 16 volts.

The audio tone is separated from the DC power and fed to a Monitron VHF FM transmitter, model T15P23 (or equivalent). There is one transmitter for each sensor, and all transmit in the 150 to 160 MHz band. All transmitters are powered by the 12 volt supply from the power conditioner. A Scala Electronics (model HDCA-5 CA5-150) tuned YAGI antenna for each transmitter is mounted on the outside of the hut.

2.2 Analogue Recording System

A set of Monitron VHF FM receivers (model R15) is located in a crate near the road to Scott Base (about 1/4 mile from the Infrasonics Lab). Antenna masts near the crate have a good line-of-sight to the RTG Hut site in Windless Bight. The receiving antennas are identical to those used by the transmitters. The receivers and transmitters are manufactured as matched pairs. Runs of spiral four cable are used to carry the audio outputs from the receivers to the Infrasonics Lab. An additional run of spiral four carries the 12 volt DC supply from the lab to power the receivers. This 12 volt supply is provided by a Valor CS15-0.4 power supply.

In the Infrasonics Lab, the audio tones are demodulated and filtered, and the data recorded and analyzed. There are two demodulator panels, or card cages; one for each array. These two card cages are similiar in function, the main difference being the bandpass of the filter section. The large or N-7 array has a bandpass of 7 to 70 second periods, while the small or N-6 array has a bandpass of 1 to 10 second periods. The N-7 array card cage is serial SCB, and the N-6 array card cage is serial WBA. The audio tone from the sensor in the RTG hut is used by both arrays.

The card cages consist of a power supply, controls and I/O connectons, and a demodulator/filter/amplifier card for each channel. The audio tone is demodulated with a phase-locked loop, resulting in a signal representing the movement of the microphone diaphragm. This signal is bandpass filtered using active filters, and then passed through a variable amplifier to permit system calibration. The amplified signal is then made available to the analogue and digital recording systems.

Outputs from the N-7 array card cage are connected to Esterline Angus A601R rectilinear chart recorders , which record at the rate of 3/4 inch per minute. A Datum 9100 Time Code Generator produces an IRIG "D" slow code which is recorded on each margin of the EA charts.

Separate outputs are available for data to be recorded by a slow-speed (1/4 inch per minute) analogue magnetic tape. A tape bias card is mounted in the N-7 array card cage to provide a 200 Hertz AC bias signal for this tape recorder. A Systron Donner 8210 clock is used to supply 5 minute and 1 hour time marks to the slow-speed tape. The tape is recorded as one half of an interleaved 14-track IRIG standard, using the odd numbered tracks. Five of these tracks are used to record the four N-7 array channels and the time marks.

Outputs from the N-6 array card cage (with the exception of RTG N-6) are connected to a three channel Helicorder drum recorder. The Helicorder records at the rate of 0.6 inches per minute, which works out to be 15 millimeters more than a full rotation per hour. Due to the small distance between adjacent traces on the helicorder chart, the input amplifiers are normally set

to 36dB attenuation, but this may be decreased if it is necessary to have an increased sensitivity on the chart.

2.3 Digital Data Acquisition and Analysis System

The digital data acquisiton system is an LSI-11 based microcomputer which collects, analyzes and records the data outputs from the card cages. The system is configured to operate as a Digital Equipment Corp. PDP-11, with peripherals for data acquisition, operator communication, timekeeping, and archival storage. This computer operates in a stand-alone environment (without an operating system) using software developed by B. David Spell in 1980.

The filtered signals are sampled by a Data Translation model DT1761 analogue to digital converter. The software routine A2DRTG is the device handler for this peripheral. N-7 array channels are sampled once per second, and N-6 array channels are sampled four times per second. The sampling order is 4,5,6,7, 4,5,6,7, 4,5,6,7, 4,5,6,7,0,1,2,3. The sampled data for each 128 second window is stored in a buffer until the buffer fills (at the end of the time window), at which time the data is written onto magnetic tape. The data from the most recent window is then analyzed by the various routines which make up the RTG8CH software ensemble. During this analysis, the data for the next 128 second window is concurrently collected.

Real time analysis provides data statistics, cross-correlations between channels, azimuth of arrival and trace velocity of assumed signals, and frequency domain filtering and analysis. Data statistics include maximum, minimum, average, RMS and standard deviation values (in "counts") for each channel. Cross-correlation analysis gives a measure of similiarity between each pair of channels in an array, and provides a time lag for the maximum similiarity. Time lag information is used to estimate the azimuth and velocity of signals. Frequency domain filtering is performed and then all of the prior analysis is repeated.

All analysis results are transmitted to the operator's console. These results are also written into the trailer of the next block on the magnetic tape.

After five to six days, a full tape is removed from this computer. A second computer using the RT-11 operating system is then used for further analysis of the collected data as necessary. This second computer has a number of peripherals to aid in the analysis of data, preparation of data messages and development of software. An operator's console with graphics capabilities, a line printer, a paper tape punch, disk drives, magnetic tape transport, CP/M emulator and system clock round out this system's peripherals.

Chapter 3

SOFTWARE OVERVIEW

The McMurdo Station Infrasonics Lab houses a computer facility with a comprehensive library of software for such needs as data collection, data analysis, data transmission, software development and documentation development. Some of this software has been written exclusively for the needs of the infrasonics program, while the more common tasks (such as word processing) are accomplished through the use of commercially available applications packages.

The use of any computer requires a sophisticated program, known as an operating system, to handle the system's devices and manage the user's programs. The Infrasonics computers make use of three different operating systems. These are $SIMRT, RT-11 and CP/M.

The data acquisition ensemble, RTG8CH, is designed to run without the presence of an actual operating system, in an effort to minimize software overhead. In practice, there must still be some mechanism for managing the use of system devices. The RT-11 Simulator, $SIMRT, fills this need. $SIMRT provides device support for the operator's console and error handling while using only a fraction of the memory space of RT-11. It has the added feature of not being dependent on a disk drive for system bootstrapping and operation.

RT-11 is a single user operating system which provides management of all of the system's devices, and a number of utility functions. It is written for use on DEC's PDP-11 series of computers, and is well documented and well supported.

CP/M is the operating system used by many of the popular home computers. Use of CP/M in the Infrasonics installation is possible through a CP/M emulator board. It must be accessed from the RT-11 operating system, but once invoked, access to system devices through RT-11 becomes transparent to the user. The ability to use CP/M based software makes it cost effective to obtain applications packages to perform tasks that, if purchased for RT-11, would be prohibitively expensive.

3.1 RT68CH

This is the mainline data collection program, developed by B. David Spell. The development process is described in *Digital Acquisition and Analysis System for Antarctica* (GIR80-3) and *Digital Data Acquisition and Analysis* (Dave's thesis). Since this program is designed to run without an operating system, it must be linked, loaded and bootstrapped in a different manner from the other programs described in this book. This program, as well as the source files for all of the subroutines in RTGLIB and MACLIB may be found on disks labeled RT68CH V22.5.

3.1.1 Algorithm Description

RT68CH performs two concurrent tasks: data collection and data analysis. The A2D Conversion handler routine, A2DRTG, supervises the sampling of the eight data channels, and assumes responsibility for storing the sampled data on the magnetic tape. Data is collected in 128 second time windows. At the end of each time window, the data block is written to the tape, and also passed to the analysis portion of the RT68CH software.

RT68CH monitors the elapsed time between completion of time windows, as the A2D converter sometimes gets caught in a hang-up state. When this occurs, RT68CH places a flag in the header of the next block, and restarts the A2D converter. This serves as an extra safeguard against data loss. The operator is alerted to a hang-up state recovery by the issuance of the message "HUNG!" to the operator's console and to the printer.

When all channels are operative, the data is sampled in the following order each second: 4,5,6,7, 4,5,6,7, 4,5,6,7, 4,5,6,7,0,1,2,3. However, if when starting a tape, the operator invokes three channel analysis, this sampling order is altered. The "missing" channel is sampled last (i.e. if 5 were the missing channel, the sampling order would be 4,6,7,5...) and analysis is performed on the first three channels. This must be indicated on the tape label as it can make a big difference when the tapes are read at a later date. For instance, routine READ assumes that all four channels are present in the normal order when it asks which channel to exclude for three channel analysis. It is not possible to perform three channel analysis with READ on a tape which has been recorded with three channel analysis, unless the bad channel was the fourth channel in that array (i.e. channel 3 or 7 only). The same is true for the Offline Analysis routines. The bad channel data will be in the fourth record in the data block file, so the X and Y coordinates of the channel positions will be mixed.

Real time analysis consists of three stages: time domain analysis, frequency domain filtering and spectral peak estimation, and then time domain analysis of the filtered data. First, the data from the A2D converter is unscrambled by subroutine UNWIND. Time domain analysis is managed by subroutine RTGTDA,

and consists of three steps. The data statistics for each channel (maximum, minimum, average, rms and standard deviation) are calculated by subroutines MAXMIN and MUNPSI. Next, the cross-correlation function for each channel pair, and the time lag for maximum correlation is calculated by subroutine RTXCOV. Finally, the time lag information is used by subroutine BEMEST to estimate the azimuth of arrival and trace velocity of the waveform of maximum correlation. BEMEST also calculates the variance of the azimuth and velocity estimates, which serves as a measure of the agreement of time lags between channel pairs.

Frequency domain analysis is handled by subroutines FILTER and PURFIL. The filter is based on the data-adaptive polarization (or pure state) filtering technique developed by Samson and Olson; whereby each filter coefficient is equal to the "degree of polarization" of the multi-channel signal at each spectral estimate. During the calculation of the filter coefficients, the spectral peak is also determined.

After completion of the filtering, the time domain analysis (with the exception of the statistics calculations) is repeated. For each block of data, all of the real-time analysis is performed on the N-6 (T) array data, and then performed on the N-7 (F) array data. N-6 array data for the most recent block is analyzed. N-7 data for four blocks (of which the most recent block is the last) is analyzed, thereby providing a sliding window analysis scheme, where the window slides one-fourth of the window length for each analysis.

3.1.2 Bootstrapping

The procedure for bootstrapping the RT68CH system is as follows:

1) Mount the program tape.
2) Restart the computer. The computer will respond with:
   28
   Start?
3) Reply: n
   The computer will respond with: @
4) Enter: 1000/
   The computer will respond with the contents of that memory location.
5) Enter the following, terminating each line with a line feed.
   12700
   172524
   5310
   12740
   60011
   105710
   100376
   5710
   100767
   12710
   60003

```
        105710
       100376
        5710
        100777
        5007
```

After each line feed, the computer will respond with the next address and its contents.

6) Enter: 1000<SHIFT>G

The computer should read the program tape and respond with:

```
      PAUSE -- MOUNT NEW TAPE
```

The RT68CH program is now loaded, and ready to operate.

3.1.3 Operation

3.1.3.1 Initialization Dialogue

The program's initialization dialogue is quite simple. Under normal circumstances, it is only necessary to enter the year (as follows):

```
RT68CH Rev 22.5^B
Tape unit is ON LINE and tape is at BOT!^B
Tape unit is ready!^B
Tape is NOT write protected--do you want to reinitialize? <CR>
^B
Do you want an immediate EOF (end of file) to precede the data? <CR>
^B
Year? 84 <CR>
^B
Time: 15-MAY-84  22: 0 27"UT?? <CR>
^B
Changes? <CR>
^B
```

The above dialogue would set up the program for 4-channel analysis on both arrays, sampled in the normal order (0,1,2,3,4,5,6,7). After 128 seconds, the analysis printout would begin. The following dialogue would set up the program for analysis without channel RTG. The time reset procedure is also shown.

```
RT68CH Rev 22.5^B
Tape unit is ON LINE and tape is at BOT!^B
Tape unit is ready!^B
Tape is NOT write protected (ring is IN)-do you want to reinitialize? <CR>
^B
Do you want an immediate EOF (end of file) to precede the data? <CR>
^B
Year? 84 <CR>
^B
Time: 15-MAY-84  22: 0 27"UT?? N <CR>
^B
Correct time? (Y,M,D,H,M) 84,5,15,22,2 <CR>
```

```
^B
Time: 15-MAY-84  22: 2  0"UT??  <CR>
^B
Changes? Y <CR>
^B
F,T or B? B <CR>
^B
F array: 3 or 4? 3 <CR>
^B
Missing channel <0,1,2,3 (or 8 if none)>: 0 <CR>
^B
T array: 3 or 4? 3 <CR>
^B
Missing channel <4,5,6,7 (or 8 if none)>: 4 <CR>
^B
A2D channels (missing channel in 4th position): 1,2,3,0,5,6,7,4 <CR>
^B
 1  2  3  0  5  6  7  4
^B
Changes? <CR>
^B
```

3.1.3.2 Commands

About 675 blocks of data are collected in one day. One 10 1/2 inch tape will last about 5 1/2 days. During data acquisition, the computer will ignore all input from the terminal with the exception of two commands. These commands are used to interrupt acquisition for a tape change, or to change the answers to the initialization dialogue. Although the command may be entered at any time, the program will not recognize it until analysis of the current block is completed. The two commands perform the following:

<SHIFT> R	This command will write 2 end-of-file marks, rewind the tape, and issue the prompt: PAUSE -- MOUNT tape!! After the tape is mounted, a carriage return will begin the initialization dialogue. This command can be remembered by the memnonic "Rewind this tape."
<SHIFT> C	This command will write 1 end-of-file mark and begin the initialization dialogue. It is intended for use when it is desired to change the analysis (i.e. from 3 to 4 channels) without starting a new tape. It can be remembered by the memnonic "Continue on this tape."

3.1.4 Program revision

This is the procedure for revising the RTG8CH program or one of its subroutines and creating a load tape.

```
.EDIT filnam.FOR
        <edit the source file as necessary>

If the revised routine is a FORTRAN routine, then:
   .FORTRAN/LIST/SHOW:1 filnam

If the revised routine is a FORTRAN subroutine, then:
   .LIBRARY RTGLIB filnam/REPLACE

If the revised routine is a MACRO subroutine, then:
   .MACRO/LIST:filnam filnam
   .R LP16
   .PRINT filnam
   .R LPINIT
   .LIBRARY MACLIB filnam/REPLACE

.LINK/MAP:RTG8CH/LDA/INCLUDE RTG8CH,RTGLIB,MACLIB
Library search? $SHORT
Library search? $SIMRT
Library search? <CR>

Mount the program tape (with a write enable ring inserted)

.INIT/NOQUERY/FILE:SY:MBOOT.BOT MT0:

.COPY SY:MBOOTP.PRI,SY:MBOOTS.SEC,DK:RTG8CH.LDA

Files copied:
SY:MBOOTP.PRI  to MT0:MBOOTP.PRI
SY:MBOOTS.SEC  to MT0:MBOOTS.SEC
DK:RTG8CH.LDA  to MT0:RTG8CH.LDA

.DIR MT0:
        the directory will show three files:
        MBOOTP,MBOOTS, and RTG8CH
```

3.1.5 Data listing description

Sigma is standard deviation, BOI is block of interest, Psi is RMS (root-mean-square), Mu is average, Rho is cross-correlation coefficient, Az is azimuth of approach, and Vel is trace velocity. I prefix means Integer (I*2) and all others are real (R*4). Date and time are in a form described in the literature.

```
.....................................................................
 1 Iblock nr / Ihard errors / Iskew errors / Ioverrange / Iunderrange
 2 station code / date / time
 3 Iblock nr / 0 / Az sigma / Vel sigma / (last BOI) / Az / Vel
 4 Time delays: 4-5 / 4-6 / 4-7 / 5-6 / 5-7 / 6-7 / average Rho
 5 individual Rho's: 4-5 / 4-6 / 4-7 / 5-6 / 5-7 / 6-7
 6 ch 4: Imax / Imin / Mu / Sigma / Psi
 7 ch 5: same as line 6
```

```
 8 ch 6: same as line 6
 9 ch 7: same as line 6
10 Iblock nr / spectral peak / same as line 3 (after filtering)
11 same as line 4 (after filtering)
12
13 Iblock range / same as line 3
14 Time delays: 0-1 / 0-2 / 0-3 / 1-2 / 1-3 / 2-3 / average Rho
15 individual Rho's: 0-1 / 0-2 / 0-3 / 1-2 / 1-3 / 2-3
16 ch 0: same as line 6
17 ch 1: same as line 6
18 ch 2: same as line 6
19 ch 3: same as line 6
20 Iblock range / same as line 10
21 same as line 14 (after filtering)
.....................................................................
        Lines 1 and 2 are general
        Lines 3 through 11 are T array
        Lines 13 through 21 are F array
        Lines 3, 10, 13, or 20 will not print if Vel is out of range
```

3.2 RT-11

The RT-11 operating system is the foundation for the use of the Offline Analysis Computer. As installed on this computer, RT-11 V03B-00(S), provides management for all of the system's devices, and a number of utility functions, while maintaining a reasonably small overhead. Users who are unfamiliar with RT-11 should consult the *Intro to RT-11* manual before attempting to use the system.

Three different system disks are provided, each intended for a specific purpose. The *Intro to RT-11* System Disk contains all files necessary to work through the *Intro to RT-11* tutorial , and makes the appropriate device assignments upon startup. The System 84 disk is the general work disk, containing all of the RT-11 utilities, MACRO, FORTRAN, BASIC, PASCAL, EDIT, TECO, CP, and a number of additional utilities. The System for CP/M disk is intended for use with CP/M, especially for file transfers between the two operating systems, or for large text outputs from the CP/M based text processing programs; as this disk contains only those files essential for data transfers and CP/M control.

3.2.1 Bootstrapping

3.2.1.1 Cold Start

The Offline Analysis Computer is normally powered-off when not in use. To bring up the system power, first power-on the operator's console and the line printer (switches at the right rear of each unit), then power-on the computer and disk drives (three switches to right of door to the computer room). Insure that the appropriate RT-11 system disk is loaded in drive 0. After performing a set of self-checks, the computer will respond with

```
 28
Start?
```

Entering "y<RETURN>" will cause the computer to install the RT-11 operating system, and execute the system commands in the file SY:STARTS.COM. When the system responds with a "." prompt, it is ready for use.

3.2.1.2 Changing System Disks

To change to a different system disk, simply load the new system disk into drive 0 and enter the command BOOT DY0:. The computer will reinstall the RT-11 operating system and execute the commands in SY:STARTS.COM.

3.2.1.3 Recovering from ODT

On occasion, a system error or accidentally hitting the BREAK key will cause the processor to halt, leaving the computer in ODT. Returning to RT-11 may or may not be possible without rebooting the system. The presence of an @ prompt indicates that the computer is in ODT. Try these procedures until the RT-11 dot prompt is successfully obtained. If there is no response within 30 seconds, or an @ prompt appears, the attempt has failed and you should move on to the next procedure. [When there is no response, you must hit the BREAK key to return to ODT.]

1. Enter: 4<SHIFT>G
2. Enter: 173000<SHIFT>G
3. Cycle the power switch for the computer and perform the procedure for a cold start.

3.2.2 Data Retrieval Routines

The data retrieval routines are used to read the information from the data tapes for performing tape summaries, creating data messages, or repeating the real-time analysis. Normally, routine SCAN will be performed as soon as a tape is removed from the data acquisition system, so that it can easily be seen what signals of interest are contained on the tape.

3.2.2.1 AZSCAN

This routine will scan the tape for all signals within operator specified parameters, and provide average values at the end of the scan. It is particularly useful for summarizing a large group of similiar signals, or for searching for signals from a specific azimuth range. Two examples are given to illustrate the use of this program.

To summarize a microbarom event at an azimuth of 270 degrees or so: Using the output from a SCAN of the tape, find the block numbers of the first and last signals of interest. Find the minimum and maximum values of azimuth and velocity for all of the signals to be included in the scan. Run AZSCAN. Choose the T array, and enter default values (enter <RETURN>) for all questions except Azimuth MIN & MAX, Velocity MIN & MAX, and Start & Stop.

To produce a listing of all events that were caused by Mount Erebus on the tape: Choose the T array, and enter default values for all questions except Minimum Rho, Statistics, All, Azimuth MAX & MIN, and CVMAX. Enter -1. for Minimum Rho, answer "Y" to Statistics and All, enter an azimuth range of 325.,345. and a CVMAX of 12.

3.2.2.2 READ

This routine repeats the real-time analysis performed by RT68CH except that data is read from the tape rather than collected by the A2D converter. This program is especially useful for performing analysis with the exclusion of one channel (in the case of channel failure), or for increasing the "tweak" factor of the polarization filter.

3.2.2.3 RPTSCN

This routine scans the tape for blocks of interest and sends the information to a file in the form of a data message. A provision is made for excluding any signals that are to be included in a signal group summary. The output file is a data message in rough form, which must be edited slightly before the tape and hard copy are cut.

3.2.2.4 SCAN

This routine scans a tape for all blocks with the prefiltered correlation coefficient greater than a user specified minimum. This is normally the first routine to be run in the course of preparing a data message.

3.2.2.5 SCNTWK

This routine combines the capabilities of routines SCAN and READ. It allows a tape to be re-analyzed (as would READ), but the output is only of those blocks where the postfiltered correlation coefficient is greater than a user specified minimum. A few portions of the RT68CH analysis algorithm are skipped, in order to reduce execution time, as these are not necessary for the final output of this routine.

3.2.2.6 STATS

This routine summarizes the data statistics values for each block in a tape. It is primarily used for background wind noise analysis, or for retreiving the data during a microphone calibration. A provision is made for summarizing the statistics of blocks of interest rather than all blocks.

3.2.3 Offline Analysis Routines

The Offline Analysis Routines permit additional analysis of the data to be performed as necessary. This set of routines falls into three categories: data handling utilities, filters, and analysis routines.

In order to use these routines, the data must first be removed from the tape, unscrambled, and stored in a disk file. The data handling utilities are used to maneuver these disk files. DATGET is the utility to retrieve the data from the tape and place it in a data block file. RECGET will copy a single channel's data from a data block file and place it in a data record file. DATLST will dump the contents of a data record file to the operator's console. DATPLT will produce a crude line printer plot of the contents of a data record file.

The filter routines use a data block file as an input, and produce a similiar data block file containing the filtered data. BEMFIL filters the data through the use of a frequency dependent beam-steer vector. PUREFL filters the data through the use of the frequency dependent degree of polarization. POLFIL is similiar to PUREFL, except that it can handle data blocks with records longer than 512 points, and uses a sliding window approach to filter the entire block.

The analysis routines operate on the data in a data block file, and produce video graphics, a hard copy, or a message file as an output. ANLYZ performs time domain analysis on records of variable length. FKDET produces a "contour map" of slowness (inverse velocity) versus azimuth at a user specified frequency. There are two versions of FKDET, one which produces video output, and the second which produces output in the form of a message file. SPCTRM produces a listing of the power spectrum for up to four channels of data. SPEKT2 produces a listing of the power, coherency, phase and trace spectra for any two records from a data block file. DATGRF produces a video graphics display of up to four records from a data block file, with provisions for

vertical scaling. OVRLAY produces a video graphics display of 3 or 4 records from a data block file, overlayed upon one another and shifted by operator input time lags; with provisions for vertical scaling and a time scale zoom.

3.2.4 Programming Languages

Assemblers, compilers, translators and interpreters are the routines that take a user written program and convert it to a machine executable code. Each computer language has its own such routine. Infrasonics RT-11 supports four languages: MACRO-11, FORTRAN, PASCAL and BASIC.

MACRO-11 is the assembly language for the PDP-11 series of computers. It allows a more efficient use of system resources than the higher level languages, at the expense of software simplicity. See *RT-11 Volume 3*, and the *Microcomputer Processor Handbook* for more information.

RT-11 supports ANSI standard FORTRAN IV , and provides a comprehensive library of system subroutines to ease the transfer of data to system devices, and handle commonly used algorithms. In addition, the Infrasonics Lab has libraries of FORTRAN subroutines for advanced computations and PLOT-10 graphics. See *RT-11 Volume 4*, *RT-11 Volume 6*, *PLOT-10 Graphics Manuals*, and *Fortran For Humans* for more information.

PASCAL is supported by a language translator. This routine translates a file of PASCAL source code into a file of MACRO source code, which may then be assembled as any MACRO program. See *RT-11 Volume 5* and *A Practical Introduction to PASCAL* for further information.

RT-11 also supports BASIC-11. BASIC is an interpreter, which means that it compiles user programs interactively. This feature makes it very useful for simple calculations or experimental programming, as changes to the program can be made simply and quickly. See *RT-11 Volume 5* and *Introduction to BASIC* for more information.

The output of each of the language handlers is a machine object code. One final step must be performed before this object code is in a machine executable form. The RT-11 Link Utility performs this task, by linking together the program and its subroutines (if any) into an executable memory image file. See *RT-11 Volume 2* for more information.

3.2.5 Utilities

RT-11 Provides a number of utilities for file transfers, device directories, text editing, and so forth. These are described in the *System User's Guide* in *RT-11 Volume 2*.

In addition, these utilities have been written for the Infrasonics System: CLEAR clears all information from the operator's console screen and sets the console to ADM-3A mode. LPINIT initializes the line printer for 12 character/inch, 6 line/inch printing with a 1 inch left margin and 1/2 inch top and bottom margins. LP16 initializes the line printer for 16

character/inch, 6 line/inch printing with a 1 inch left margin, but no skip-over-perforation (top and bottom margins). REWIND causes the tape on MT0: to rewind. SETDAT sets the RT-11 system calendar and clock from the TCU-50 battery powered clock. SETTCU sets the TCU-50 clock from the RT-11 system calendar and clock. CP bootstraps the CP/M emulator. All of these utilities are invoked by the .R monitor command.

3.3 CP/M

A Decmation D100Q CP/M Emulator (Z-80 processor with 64 kbytes of memory) allows software written for many home computers to be used on the Infrasonics system. The advantage of this is that the competition in the home computer software market is keeping the prices low. Although RT-11 must be present in order to invoke CP/M, once this has been done, the computer behaves as if it were a CP/M machine and most inter-system data transfers are transparent to the user. There are a few exceptions to this rule, where utility routines have been made available to bypass slow and awkward data transfer. For example, data transfers from a text processor directly to the line printer are unbelievably slow, so an intermediate step is taken by sending printer output from a CP/M routine first to an RT-11 file, DK:CRAYON.LST. This file is then printed using the RT-11 monitor command .PRINT CRAYON. For more information see the D100Q manual in *CP/M Volume 1* and *The CP/M Handbook*.

The actual CP/M operating system takes only two disk blocks. Since these two blocks are reserved for CP/M, writing CP/M onto all CP/M format disks costs no additional overhead, and is highly recommended. Use GENSYS to write CP/M onto a new disk.

Five working CP/M system disks are provided. CP/M System with PALANTIR includes most of the standard CP/M utilities and the PALANTIR Word Processor (WP) . MINCE & SCRIBBLE includes a few file handling and data transfer utilities, and the Amethyst (i.e. MINCE, SCRIBBLE, and CRAYON) text processing routines. The SCRIBBLE Disk contains a subset of the MINCE & SCRIBBLE disk and is intended for "scribbling" a large number of files together. The BDS C Working Disk contains compilers, libraries and the link utility for BDS C. FORTH Working Disk contains the FORTH interpreter and screen files.

3.3.1 Bootstrapping

To invoke CP/M, you must first have booted an RT-11 system disk with the files CP.SAV and CPM.INI on it. By issuing the monitor command .R CP the D100Q control program is invoked. A --> prompt indicates the D100Q Control level. At this level RT-11 to CP/M logical device assignments are made, and then the CP/M disk is bootstrapped. The command file CPM.INI does this automatically. When the A> prompt appears, CP/M is running, and disk A is the default disk.

3.3.2 A Few Idiosyncracies

The delete (<SHIFT><RUB>) key does not serve its normal function of backspacing and erasing the previous character in CP/M as it does in RT-11. Using the backspace (<CTRL>H) in CP/M serves the same purpose as the delete in RT-11. (The delete key does, however, serve its normal function in MINCE.)

The caret "^" is used by the D100Q as a control character prefix. This is available to get around the fact that <CTRL>S and <CTRL>Q still perform their normal RT-11 functions of pausing the screen display. If these control codes are to be used by a CP/M routine, ^S (caret-S) and ^Q will perform that function.

If it becomes necessary to change the logical device assignments, or abort a CP/M program, entering ^C (caret-C) will return to the D100Q Control level. The D100Q Control level commands are described in the D100Q manual in *CP/M Volume 1*.

3.3.3 Returning to RT-11

Exit from CP/M to the D100Q Control level by entering ^C (caret-C). The D100Q Control level command "bye" will return the computer to RT-11.

3.3.4 Text Handlers

Three text handlers are available on the Infrasonics CP/M system. MINCE, SCRIBBLE, CRAYON and PENCIL are part of a text processing package marketed as Amethyst . MINCE is a powerful screen editor, SCRIBBLE is a text formatter, CRAYON is a utility for sending the finished product from SCRIBBLE to the printer, and PENCIL is a utility for sending any text file to the printer in a "dressed up" form. PALANTIR is an interactive word processor which, in some ways, combines the capabilities of MINCE and SCRIBBLE, however MINCE and SCRIBBLE have much less overhead in terms of memory and disk space and are somewhat more powerful. Each one has its advantages. See *CP/M Volume 2* for more information.

3.3.5 Programming Languages

The CP/M system supports three programming languages. ASM is an assembler for the Intel 8080 processor. FORTH is an interactive language interpreter. And BDS C is a compiler. For additional information, consult *CP/M Volume 1*, *CP/M Volume 2*, *Discover Forth*, and *The C Programming Language*.

3.3.6 Utilities

The standard CP/M utilities are provided for file transfers, text handling and other system needs. These include DDT, DUMP, ED, LOAD, MOVCPM, PIP, STAT, SUBMIT, UNLOAD and XSUB. These are described in *The CP/M Handbook*.

A number of additional utilities are provided with the CP/M system. CAT is an extended device directory utility. ALPH alphabetizes a text file by lines. GENSYS writes CP/M onto a new disk. INITFL initializes the directory of a disk. OTHELLO is a game. REC transfers RT-11 files to CP/M files. SEN transfers CP/M files to RT-11 files or devices.

Chapter 4

SYSTEM OPERATION

4.1 Routine Operating Procedures

4.1.1 Daily Obs

These are the duties which must be performed daily at about 1:30 pm (0130UT) in order to maintain a minimum of data collection:

4.1.1.1 EA Chart Records

1. Mark the current (Universal) date and (Universal) time, and the station name on each of the four Esterline Angus chart records in the grey equipment rack. There is a clock in the top of the blue and white equipment rack. You can read the proper date from the computer terminal by the computer room door.

2. Replace each chart with a new chart (stored on top of the grey equipment rack). Using the knob to the right of the writing surface, advance the chart about six inches, then cut or tear the chart just below the writing surface. Now wind the remaining supply chart back from the writing surface, and pull the paper out of the feed slot. This will expose the instruction panel which will provide further information.

3. Mark the current date and (Universal) time, and the station name on each of the four new charts.

4. Put the old charts into the boxes (that you took the new charts out of) and label each box with station name, start date (yesterday's date) and stop date; and store them in the large box on the floor. Dispose of the unused chart paper in the bag beside the grey equipment rack.

4.1.1.2 Slow-Speed Analogue Tape

Put a time mark on the slow-speed analogue tape (in the bottom of the grey equipment) according to the format shown on the labels on the tape transport. This time mark should be made on some multiple of five minutes.

4.1.1.3 Helicorder

Change the helicorder chart as follows:

1. Pull the STYLUS LIFT knob out

2. Pull the OFF/ON/RESET knob out and rotate counter-clockwise until the left stylus is about 1/4 inch from the left edge of the drum

3. Rotate the drum until the crack is facing you. On each side of the drum there is a large knob and a small latch. Rotate the two large knobs in opposite directions so that the paper lifts away from the drum. When the paper is loose, rotate the latches (one up and the other down) to release the paper. Remove the paper from the drum, and place on the battery box in the stack near the wall.

4. Write the time and date that the chart was stopped at the bottom of the chart.

5. Take a blank piece of chart paper from the stack near you on the battery box. Only one side of the paper will write, so be sure that the side that is up in the stack ends up on the outside when on the drum.

6. Insert one end of the paper into the crack, and rotate the drum (up and away from you) so that the paper wraps around the drum. Now insert the other end of the paper into the crack and close the latches (small knobs towards center of drum). Turn the large knobs until the paper pulls tight against the drum. If one edge is tight before the other, do not worry as it will slip rather than tear the paper.

7. Write the time and date along the left edge of the paper, above the crack. Move the crack up near the styli, and mark on the paper near each stylus: A for the left stylus, V for the center, and N for the right stylus.

8. Move the OFF/ON/RESET knob to the center position, and push the STYLUS LIFT knob in. If the trace does not begin writing within 30 seconds, insure that the control knob is in the center position.

4.1.1.4 Audio Tones

Using the headphones hanging from the front of the blue and white equipment rack, check each of the seven tones (each of seven pairs of banana plugs). The tone should be clear and reasonably loud. If the tone is not present, or sounds distorted, consult the chapter on Troubleshooting.

4.1.1.5 Digital System

Check the operation of the printer by the open window, particularly that the ink ribbon and paper are feeding properly. The printer should print one or more lines every minute or so. If this is not the case, check the following:

1. If the bottom line shown on the terminal is "**HUNG!**" the output should continue within five minutes. If not, start a new tape (see below).

2. Under normal circumstances, the output lines are mostly numbers. An error condition will cause the output of one or more lines of text message. In most cases, this message will repeat every 128 seconds. Check the tape transport in the top of the right equipment rack in the computer room. If the ON LINE indicator is not lit but the tape is loaded (i.e. the tape is under tension from the tension arms, push the ON LINE button. Otherwise, it will probably be necessary to start a new tape.

3. If the terminal is still outputting lines, but the printer is not echoing them, then the problem lies with the printer. Check the power. There is a reed switch which has been taped down to allow operation without the cover. This may have come loose. If problems persist, consult the IDS-440 manual in *Equipment Volume 4*.

4.1.1.6 Log Book Entries

Enter the following information in the log book on the desk:

1. Universal date

2. Outdoor temperature in celsius (thermometer by front door)

3. Indoor temperature in celsius (thermometer between breaker boxes)

4. Relative humidity (RH meter above breaker boxes)

5. Universal time that charts were changed

6. Universal time that analogue tape was marked

7. Universal time that helicorder was changed

8. Any remarks regarding serious data loss

4.1.2 Computer System Operation

4.1.2.1 Changing The Tape

A data tape will last for five days (approximately 3350 blocks) with several hours of leeway. The current block number is the number immediately following a "#" (number) symbol in the first column of output. A new block number is output about every 20 lines. Follow these steps to change the tape:

1. To initiate a tape change, enter <SHIFT> R on the terminal keyboard. When the computer finishes analyzing the current block, it will start rewinding the tape and issue the response "PAUSE -- Mount Tape!!"

2. Blank tapes are stored on the lower shelves of the tape rack (or in boxes in the left part of the storage shelves in the back of the room). Take a blank tape and remove the hanging ring and the adhesive tape that holds the end of the magnetic tape. Save the adhesive tape on the front of the tape reel. Put a tape label on the reel and mark the tape number. Labels are stored on the light table, or may be found in a new box of tapes.

3. When the old tape stops rewinding, push the "rewind" button to unload the tape.

4. Remove the tape reel by pulling out the knob in the center of the reel.

5. Remove the plastic ring from the back of the reel of the old tape. Put the reel into a hanging ring to protect the tape from dust.

6. Clean the tape head and tape path with the aerosol cleaner and q-tips which are stored above the storage drawers to the right of the equipment racks.

7. Mount the new tape. The tape path is shown on the front of the tape transport. Be sure that the fluxgate is firmly against the tape head after the tape is in place.

8. Load the tape by pressing the LOAD button. The tape will advance to the load point and the button will illuminate.

9. Press the ON LINE button, and insure that the button is illuminated.

10. Return to the work room. Enter <RETURN> on the terminal keyboard. The computer will print the status of the tape transport. If the tape is ON LINE, at BOT and NOT WRITE PROTECTED, you may proceed with the startup dialogue, which consists of five questions. Unless one of the microphones has failed, or the time is more than 60 seconds off, all questions may be answered by simply entering <RETURN> -- except the question "Year?" which must be answered with a two digit integer followed by <RETURN>. If, however the tape transport is not ready,

correct the problem before proceeding with the dialogue. (If INITAP did not fail to initialize, you must answer the first question with Y <RETURN> after correcting the problem.

11. The computer should now operate without further intervention for another five days. It will be about two minutes before the first line is output.

12. Remove the past five days' printout from behind the printer and store it on the couch. Be sure that the current printout is folding properly.

4.1.2.2 Log Book Entries

Record the following in the log book:

1. The old tape number and stop time

2. The new tape number and start time

3. The number of blocks on the old tape

4.1.3 Supplies

A printer ribbon will generally last about 10 days. Ribbons are stored at the left side of the shelves near the printer, in blue and white boxes.

A case of paper will generally last about 20 days. Paper is stored on the bottom shelf in the back of the computer room.

A case of charts will generally last about one month. Charts are stored at the right side of the storage shelves in the computer room.

4.2 Data Messages

4.2.1 Data Message Preparation

After removing each tape from the Data Acquisition System, a data message summarizing the contents of the tape should be prepared and sent to the Geophysical Institute. Several Data Retrieval routines have been written to accomplish this task in an efficient manner.

Data messages are transmitted from McMurdo station via the Navy communications network, which entails a fairly complex scheme of message routing format that must be included as header and trailer information to the message itself. In addition, the messages are transmitted by archaic radioteletype equipment, which requires that the message be cut onto a 5-level Baudot code paper tape. Although text messages must be approved by the NSF

Rep or Station Science Leader, data messages may be prepared and delivered directly to the Communications Department in Building 165. A block of message serial numbers has been alloted to Infrasonics, and a log book of the use of these numbers is maintained. The message header and end-of-message formats are described on the first page of the *Data Message Log* book.

Use the following procedure to prepare a data message for transmission:

1. Bootstrap the Offline Analysis Computer with the System 84 disk in drive 0 and the *Scan Files* disk in drive 1. Clean the tape head and then mount the tape on the tape transport above the disk drives. (Be sure that the write enable ring has been removed, and that the transport is on-line.)

2. Produce a tape scan using the program SCAN . Entering default values for all questions (except F, T, or B?) will produce a scan of the tape on the line printer. A pass for the T array should be performed first, followed by a pass for the F array. Upon completion of each scan pass, the program will ask whether you want to continue from the current tape position, rewind the tape, or exit the program. After the first pass the tape should be rewound, and after the last the program should be exited. (Note: exiting the program by use of a <CTRL>C will cause the last part of the scan to be lost.) Use the rewind utility (.R REWIND) to rewind the tape after exiting a data retrieval program.

3. Inspect the information from the tape scan for groupings of similiar signals which can be summarized as a single event. Typically, groupings will be of microbarom or mountain associated infrasound events. Look for 10 or more blocks within a 24-hour period with similiar azimuth, velocity and variance values. Find the block numbers of the first and last block in each grouping. Using this information, and program AZSCAN, summaries of each of these groupings can be produced. One pass of AZSCAN must be made for each grouping. As with SCAN, after each pass the choice of continuing, rewinding or exiting is given.

4. Program RPTSCN may now be used to produce a disk file containing summaries of all of the events not included in groupings in the standard data message format. RPTSCN will query for information required for the message header and then ask for SKIP PARAMS, the parameters of the groupings, in order to skip those signals which are included in event groupings. Once again, two passes must be made, one for each array, and the same three choices are available at the completion of each pass.

5. The output of RPTSCN is a file on drive 1 called DY1:FTN19.DAT. This file must be edited to add the start and stop times of the tape, and the grouping summaries. Insure that the *Mince and Scribble* disk is in drive 2 and the *Message Files* disk is in drive 1. Using the monitor command .R CP, boot the CP/M system.

6. Transfer the data message file to CP/M with the command A>REC B:MTyynn.MSG (where yynn is the tape year and number). The REC utility will give a prompt for the RT-11 file specification (DY1:FTN19.DAT). Using the screen editor, MINCE, add the tape information and the event grouping summaries to the file.

7. Send the finished data message to the paper tape punch (be sure that the punch is turned on) using the SEN utility (A>SEN B:MTyynn.MSG). The SEN utility will prompt for the destination file specification (which is PC:). When the CP/M prompt returns indicating that the tape is punched, exit to the CP/M Control Level (caret-C) and enter the command SEN:LP: in order to direct the SEN utility output to the line printer. Use the command GO to return to CP/M. Enter the command SEN B:MTyynn.MSG to make a hard copy of the data message. When the CP/M prompt returns, form-feed the printer and make a second copy using the SEN utility once again.

8. Enter the appropriate information in the *Data Message Log* book, and save one of the hard copies in the *Message Traffic* book. Deliver the paper tape and the other hard copy to the Communications Department.

9. Rewind the tape and remove it from the transport. Insure that the start time, stop time, and number of blocks are written on the tape label, and that the tape number, program name and revision number are written on the label in the Tape-in-Seal.

4.2.2 Message Format

The details of the Navy message header and end-of-message are given in the *Data Message Log* book. Starting after the SUBJ: line, each "paragraph" is numbered. Para 1 contains information on the tape itself:

1.MT84-59 0150UT 25SEP84 TO 0143UT 30SEP84 3359BLOCKS

and paras 2 and following contain information about the signals on the tape. All N-6 (T) array groupings are listed first, followed by all individual N-6 array signals. These are followed by all N-7 (F) array groupings, and finally by the N-7 array individual signals. An unnumbered comment or greeting follows the signal information, and this is followed by the end-of-message. The following is a typical grouping summary and a typical individual event summary:

2.MB:0331UT 27SEP TO 0118UT 28SEP BKS1392-1991 134SIG AZR256-274
SE6.8 MAXR0.91 AVDR0.11 MAXDR0.20 AZ269 CZ2 V352 CV14
3.T:0508UT 26SEP BK1071 SE7 R0.79 DR0.16 AZ261 CZ2 V361 CV15

The abbreviations used in the messages are as follows:

T:	individual N-6 array signal
F:	individual N-7 array signal
MB:	summary of microbarom event grouping
ER:	individual (or group of) erebus related signal(s)
MAI:	summary of mountain associated infrasound event grouping
AIW:	individual (or group of) auroral infrasonic wave signal(s)
UT	universal time
BK(S)	block number (or range of block numbers)
SIG	number of signals in grouping
AZR	azimuth range of signals in grouping
SE	peak spectral estimate (of period) of wave in seconds

MAXR	maximum value of average correlation coefficient (after filtering)
R	value of average correlation coefficient (after filtering)
AVDR	average value of change in correlation coefficient (due to filtering)
MAXDR	maximum value of change in correlation coefficient (due to filtering)
DR	value of change in correlation coefficient (due to filtering)
AZ	estimate of azimuth of arrival of signal (or average of grouping azimuths)
CZ	variance of azimuth estimate (or average of grouping variances)
V	estimate of trace velocity of signal (or average of grouping velocities)
CV	variance of velocity estimate (or average of grouping variances)

Each line must end with two carriage returns and one line feed. This is done automatically by RPTSCN for the message lines that it creates. Additional lines added by the operator (as in step 6 above) must include an extra carriage return prior to the carriage return and line feed that are created by the <RETURN> key. In MINCE, this is easily accomplished using the sequence ^Q<CTRL>M (i.e. a caret, a Q, and a control-M) just prior to the <RETURN> key.

4.3 Preventative Maintenance

This section contains a summary of the periodic preventative maintenance tasks which should be performed on the system equipment. All preventative maintenance (except the filling of EA recorder inkwells) should be recorded in the *Maintenance Log Book*.

4.3.1 Semi-Monthly

The inkwells in the EA Chart Recorders should be filled on the first and fifteenth of each month. Ink bottles, a filling syringe and a priming syringe are stored on the shelves between the heat exchanger windows. Usually the inkwells will hold about two syringes of ink. Do not overfill the inkwells.

4.3.2 Monthly

The Air Conditioner (or Heat Pump, as local engineers prefer to call it) filter should be cleaned during the first week of each month. Remove the front panel from the air conditioner and take out the foam rubber filter. Vacuum the filter, or wash in soapy water as necessary, and replace in the air conditioner.

4.3.3 Bi-Monthly

The following two tasks should be performed during the first week of odd-numbered months (JAN, MAR, MAY, JUL, SEP, & NOV).

The print head carriage assembly of the IDS-440 printer should be lubricated. Consult section 5.4.2 (page 5-7) of the manual in *Equipment Volume 4*. A bottle of NYE oil is stored in the Printer Parts box.

The water level and specific gravity of each cell in the fourteen batteries for the UPS systems should be checked. Any battery with a cell with a specific gravity less than 1200 should be replaced. The battery cable may be disconnected from the UPS without any effect on the power supply (provided there is no interruption to AC power while the batteries are disconnected). Exercise caution with the battery cable as it will be "hot" until disconnected from both the UPS and the batteries. When reconnecting the batteries to the UPS, some arcing will occur. This can be minimized by first disconnecting the third battery from the fourth, then connecting the battery cable to the UPS, and finally reconnecting the third and fourth batteries.

4.3.4 Quarterly

The following tasks should be performed during the first week of the first month of each quarter (JAN, APR, JUN, & SEP).

The Digi-Data 1749 Tape Transports should be thoroughly cleaned and the head and capstan inspected for wear. Consult sections 5.2, 5.3.2 and 5.3.3 (page 5-1) of the Digi-Data 1749 manual in *Equipment Volume 4*.

The Epson RX-80 Printer should be cleaned and inspected. Consult page 4-1 of the Epson manual in *Equipment Volume 6*.

The water tank and humidifiers should be cleaned, and the humidifier belts should be changed if necessary.

4.3.5 Semi-Annually

The following two tasks should be performed during the first week of April and September.

The Elgar UPS units sould be cleaned and inspected. Consult section 5.6 (page 5-1) of the UPS manual in *Equipment Volume 4*.

The ionizing points of the Aerostat should be cleaned. Carefully insert each point into a rubber eraser (i.e. a pencil eraser) and rotate the eraser to remove any buildup.

4.3.6 Annually

The following tasks should be performed during the first week of September.

The power supply voltages of the PDP11 mounting box should be checked. Consult the BA11-N section of the *Microcomputer Interfaces Handbook*.

The Disk Drives should be cleaned and aligned. Consult page 5 of Appendix C of the DSD-440 manual, and page 7-1 of the DSD-430 manual, both in *Equipment Volume 5*.

The Digi-Data 1749 Tape Transport requires a number of annual alignment checks to be performed. These are listed in chapter 5, and described in chapter 10 of the Digi-Data 1749 manual in *Equipment Volume 4*.

The pitch of the paper tape punch of the Addmaster 510 should be checked. Consult sections 5.3.2 and 5.3.3 (page 40) of the Addmaster 510 manual in *Equipment Volume 5*.

The bearings of the EA Chart Recorders and of the Helicorder should be lubricated. Consult page 16 of the EA manual and section 5.4 (page 17) of the Helicorder manual, both in *Equipment Volume 8*.

The calibration of the three voltmeters (Fluke 8060, Fluke 8020 and Triplett 310) and the oscilloscope should be checked against some reference if possible. The Navy electronics shop should be able to give assistance. If any meter is well out of calibration, it should be returned to the states for service.

Chapter 5

SYSTEM CALIBRATION

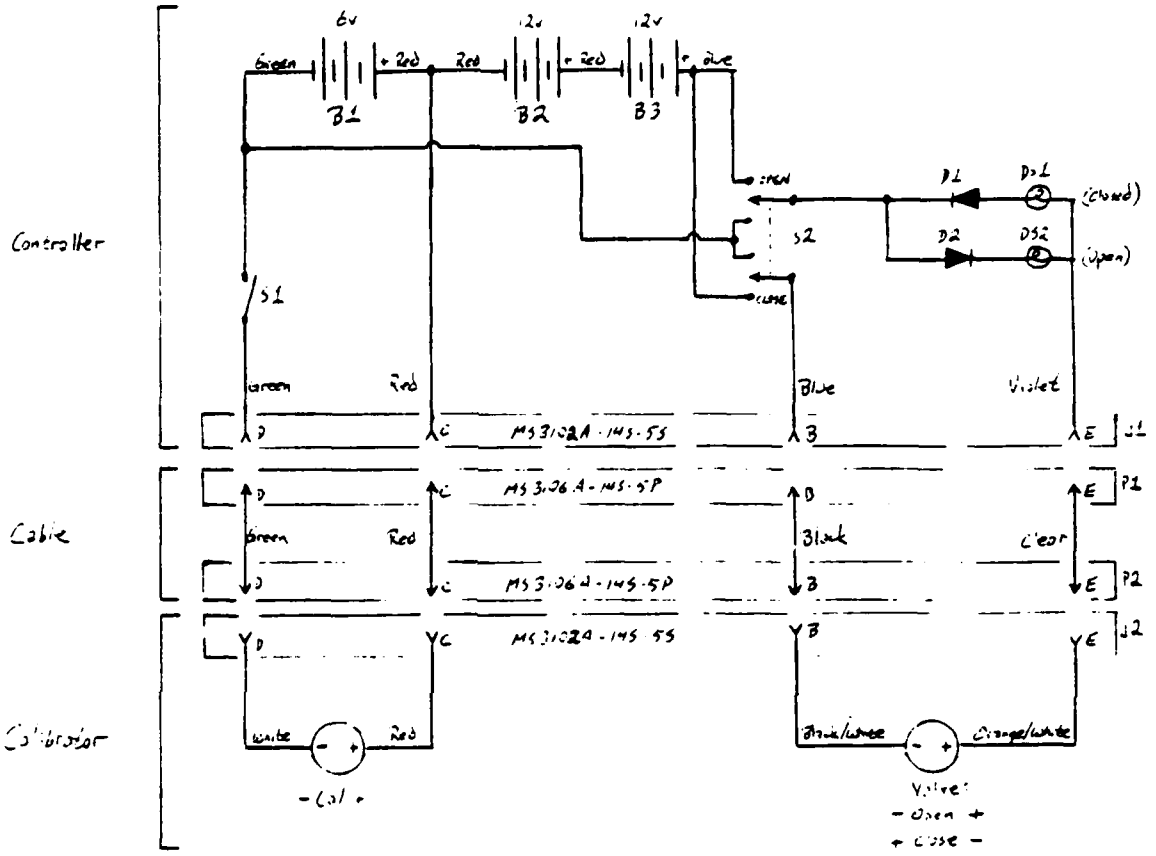
5.1 Description

The demodulators should be calibrated annually. This is normally done during January when the equipment at Windless Bight is moved to the surface of the snow. A calibration must also be performed whenever the microphone, microphone capsule or oscillator is replaced, or if the discriminator card is replaced by one that has not been calibrated for that channel.

There are two calibrator control boxes. One of these is used for RTG N-7, AUR, VEE and NOV and supplies 30vdc to the valve and 6vdc to the pump. The other box is used for ERE, TER, ROS and RTG N-6 and supplies 6vdc to the valve and 12vdc to the pump. Schematics of the two calibrator/control box assemblies are shown in figures 1 and 2. Most of the calibrators have a four pin connector, but some have a six pin connector instead. A 4-pin to 6-pin adapter is included with the smaller control box. Both control boxes work in the same way. The pump switch simply turns the calibrator pump on or off. A 3-position switch is provided to control the motion of the valve. The switch is set to the CLOSED/CALIBRATE position to move the valve to that position. When the valve is fully in position, the indicator lamp will glow (brighter). At this time the switch should be returned to the off (center) position. Likewise, the switch is set to the OPEN/OPERATE position to move the valve to that position, and when the lamp glows, the valve is in position and the switch should be turned off. It takes up to 60 seconds for the valve to move from one position to the other.

The calibrator itself is a black box contained in the microphone can. It is an essential part of the microphone, and must always be installed. Each calibrator consists of a valve and motor, and a bellows and motor. The size of the bellows determines the peak to peak swing of the calibration signal. All calibrators swing approximately 10 microbars peak to peak, except for AUR & NOV which are 8.4 microbars, and VEE which is 8.6 microbars. The speed of the bellows motor determines the period of the calibration signal. N-7 calibrators have about a 15 second period, and N-6 calibrators have about a 7 second period. If the period of the signal is substantially longer, then the pump batteries need to be replaced. Since the RTG microphone is used by both arrays, there are two calibrators for it. One is kept in the microphone, and the other is kept in the RTG hut.

Calibrator and Controller System
for RTG N-7, Aurora, Vee, & Nova



Calibrator : modified N5 model
B1 : 6 volt, Eveready 731 or equivalent
B2, B3 : 12 volt, Eveready 732 or equivalent
S1 : SPST miniature toggle : CAL ON/OFF
S2 : DPDT center off miniature toggle : VALVE OPEN/OFF/CLOSE
D1, D2 : Rectifier diode, 1N4003 or equivalent
DS1 : GE 1819 (28vDC, 40ma) red lens : CLOSED
DS2 : GE 1819 (28vDC, 40ma) amber lens : OPEN
P1, P2 : 5 pin male Amphenol MS3106A-14S-5P
J1, J2 : 5 pin female Amphenol MS3102A-14S-5S

Figure 1. Large Control Box Schematic

Calibrator and Controller System
for RTG N-6, Erebus, Terror & Ross

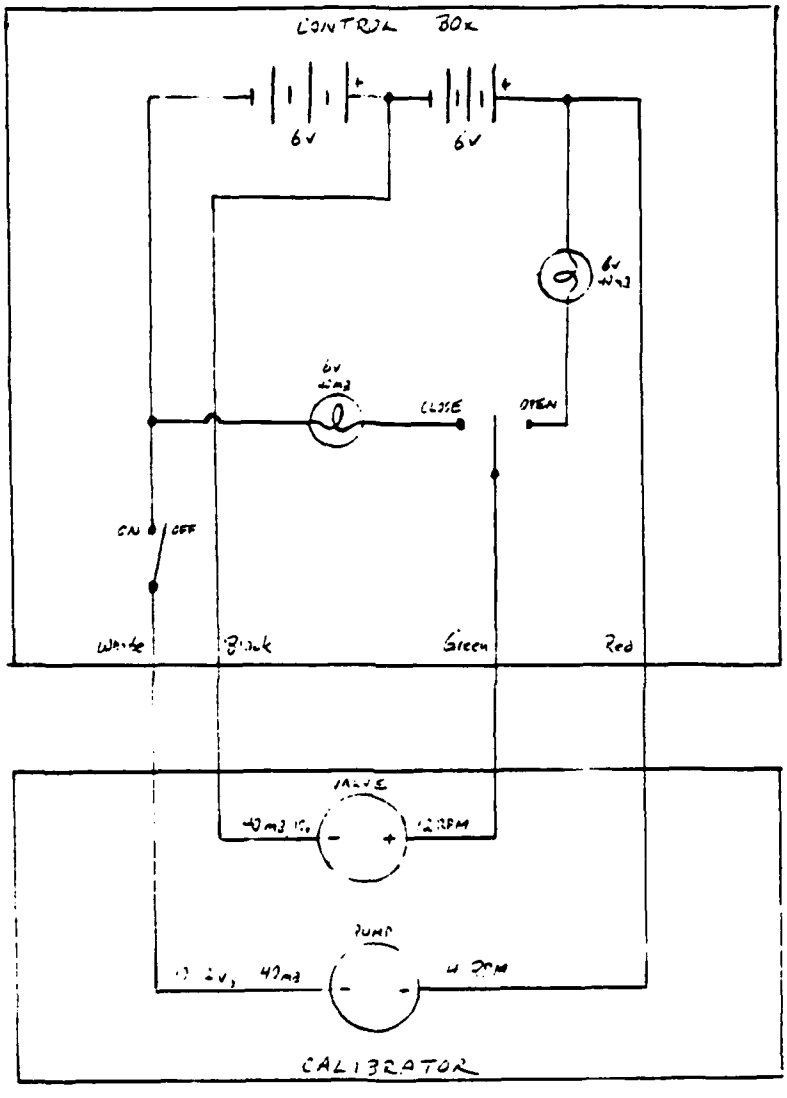


Figure 2. Small Control Box Schematic

The discriminators are in card cages in the grey equipment rack in the Infrasonics Lab. There is one card cage for each array. The upper card cage, labeled WBA, is for the N-6 array. The lower card cage, labeled SCB, is for the N-7 array. All discriminator cards have a serial number on the lower left corner of the component side of the card, which indicates which array the card is to be used for. On the back of each card cage are three columns of banana plug connections. The left column is the tape outputs, the center column is the inputs, and the right column is the discriminator outputs.

The SCB card cage outputs are connected to the A2D converter (black banana pair) and an EA chart recorder (purple, blue or green banana plugs). The A2D converter plug is physically closest to the back panel of the card cage.

The WBA card cage outputs are connected to the A2D converter (black banana pair), the helicorder (black banana pair) or its equivalent resistance (yellow banana pair), and an EA equivalent resistance (green banana plugs). The A2D converter plug is physically closest to the back panel of the card cage, and the EA equivalent resistance is physically farthest from the panel.

Since the N-6 array channels are not connected to the EA chart recorders, it is necessary to do some rearranging of connections at the back panel of the card cages during the course of the calibration procedure. These connections are described in the procedure steps. Also, in order to increase the sensitivity of the N-6 array, an N-6 CAL resistor (red banana pair) is inserted physically between the A2D converter plug and the EA chart recorder plugs.

The party at Windless Bight actually has very little to do during the calibration process. However, the microphone is very sensitive to vibration, so it is imperative that all members of the party remain stationary during the calibration and quiet test periods. Get comfortable in advance, the whole process can take an hour or so.

5.2 Procedure

The calibration procedure follows. Instructions for both parties are given. Instructions for the operator in the Infrasonics Lab are preceded by LAB, and instructions for the party at the microphone site are preceded by WBA.

1. LAB & WBA: Establish communications between the microphone site and the Infrasonics Lab, and insure that both parties know which microphone is to be calibrated.

2. WBA: Connect the control box to the calibrator, manually close the air hose valve, and move the valve to the CLOSED/CALIBRATE position. Now sit quietly near the radio. You have a long wait ahead of you. No walking around unless instructed to do so by the operator at the lab.

3. LAB: When the valve is closed, there should be one or more large pulses on the chart record. Wait about 3 minutes for these filter transients to die out, then insure that the output trace is reasonably straight. If the trace does not become sraight, have the WBA party insure that the valve is fully closed.

4. LAB: If the channel to be calibrated is part of the N-6 array, disconnect the RTG chart recorder (purple banana plugs) from the RTG N-7 channel, and disconnect the EA equivalent resistance (green banana plugs) from the channel to be calibrated. Also disconnect the helicorder (black banana pair) or (if RTG N-6) the helicorder equivalent resistance (yellow banana pair) from the channel to be calibrated. Connect the N-6 CAL resistor (red banana pair) and the chart recorder to the channel to be calibrated. Connect the EA equivalent resistance to RTG N-7. [The black banana pairs closest to the panel on each channel are the A2D converter inputs. These should never be disconnected.] When all is done, the channel to be calibrated should have only the A2D converter, N-6 CAL resistor, and the chart recorder connected to it.

5. LAB: Move the toggle switch (SW-1) on the edge of the discriminator card for the channel to be calibrated to the ZERO CHECK (up on older cards, down on newer cards--newer cards are marked) position.

6. LAB: After the transients have settled, wait 5 (N-6) or 12 (N-7) minutes, then check the average value for that channel (in the most recent block of data) on the video terminal. Using trimpot Z-1 (just above SW-1), adjust the LP zero. Turning Z-1 clockwise gives a more positive value. Repeat as necessary to give a 0.0 +10.0 value, allowing 5 or 12 minutes after each adjustment.

7. LAB: If the channel to be calibrated is part of the N-7 array, adjust the zero control on the chart recorder (below the takeup reel) to center the pens.

8. LAB: Return SW-1 to the RUN position. When all is quiet, have the WBA party turn on the calibrator pump.

9. WBA: When instructed, turn the calibrator pump on, and go back to sitting quietly. Now comes the really long wait.

10. LAB: Wait three minutes for the transients to settle, then measure the peak to peak swing of the calibration signal. The peak to peak swing should be 1.0 cm per microbar (e.g. a 10 microbar calibrator should produce a peak to peak swing of 10 cm). Adjust trimpot A-1 (the top trimpot) on the edge of the discriminator card for the channel being calibrated to produce the desired peak to peak swing. Turning this pot clockwise increases the swing. After each adjustment, it will be necessary to wait three minutes (for N-7) or 30 seconds (for N-6) for transients to settle.

11. LAB: After the transients have settled, wait 5 (N-6) or 12 (N-7) minutes, then check the average value for that channel (in the most recent block of data) on the video terminal. Using trimpots Z-2 and Z-3

(just below SW-1, Z-2 on left), adjust the HP zero. Z-2 is the coarse adjustment and Z-3 is the fine adjustment. Turning Z-2 or Z-3 counter-clockwise gives a more positive value. Repeat as necessary to give a 0.0 ±10.0 value, allowing 5 or 12 minutes after each adjustment.

12. LAB: If the channel being calibrated is part of the N-6 array, disconnect the chart recorder (purple banana plugs) and N-6 CAL resistor (red banana pair) from the channel. Disconnect the EA equivalent resistance (green banana plugs) from the RTG channel. Connect the chart recorder the RTG channel. Connect the Helicorder (black banana pair) or (if RTG N-6) the Helicorder equivalent resistance (yellow banana pair) and the EA equivalent resistance to the channel being calibrated.

13. LAB: If the channel being calibrated is AUR, VEE or NOV, set the helicorder attenuation for that channel to 24 dB and adjust the helicorder gain trim to give a peak to peak swing on the helicorder of 33.6mm (for AUR or NOV) or 34.4mm (for VEE). It will not be necessary to wait for filter transients for this adjustment. When finished, return the attenuation to 36 dB.

14. LAB: Record the NEXT block number to come up on the video terminal. Allow four (N-6) or nine (N-7) additional blocks to be collected. Record the last block number in this group as well. While you are waiting for these blocks to collect, determine the period of the calibration signal by timing several (at least 20) cycles. Also record the channel name and the discriminator card serial number.

15. LAB: Inform the WBA party that the calibration is done, and that you are ready to begin the quiet test.

16. WBA: When instructed that the calibration is complete, measure the frequency swing of the calibration signal with the Fluke 8060 multimeter, then turn off the calibrator pump.

17. LAB: Once again, allow three minutes for the transients to settle. Record the NEXT block number to come up on the video terminal. Allow four (N-6) or nine (N-7) additional blocks to be collected. Record the last block number in this group as well.

18. LAB: A spare discriminator card should be calibrated for each channel (provided that there are enough cards to go around). Remove the discriminator card just calibrated, and replace it with one of the spares. Insure that both cards are appropriately marked with the channel name, etc. Repeat the entire process from step 4.

19. LAB: After completing the calibration of the second card, instruct the WBA party to open the valve.

20. WBA: Move the valve to the OPEN/OPERATE position. Inform the operator at the lab when the valve is open. Once again, no walking around until the operator has confirmed a normal output from the microphone. Wait for a sort quiet test with the calibrator valve open and the manual valve closed. This is to check for air leaks.

21. LAB: Insure that the channel is producing a straight line. (For RTG N-6 it will be necessary to connect the RTG chart recorder to the RTG N-6 output briefly to view the output.) Inform the field party when you are convinced that the signal is sufficiently quiet.

22. WBA: Open the manual valve and wait for confirmation of a normal output.

23. LAB: Wait once again for the transients to die out, then insure that the output is normal. When all is well, inform the WBA party that they may pack up and move on to the next microphone.

Chapter 6

TROUBLESHOOTING

Most equipment failures have occurred within the analogue portion of the system. Such failures are easily seen by checking the quality of the graphical output (EA recorder or helicorder) of each channel. It is then possible to determine whether the failure is within the building or outside the building by checking for the presence and quality of the audio tone. Failures within the digital portion of the system may not be as obvious until an attempt is made to read the data tape. Fortunately, there is really not very much that can go wrong short of the failure of a board or peripheral unit, either of which can simply be swapped for a spare unit. Most of the digital system failures will be self diagnosing (i.e. tape transport won't work, or clock board does not keep accurate time) as to where the fault lies. It is the failures outside the building that really require careful attention in troubleshooting.

6.1 Failures in the Field

An equipment repair trip to Windless Bight can be a major undertaking, especially during the dark winter months. For this reason, it is best to know where the fault lies before departing to make repairs. The most likely failures at Windless Bight are power supply failure, microphone oscillator failure, broken space filter, broken land line, or transmitter failure.

6.1.1 Power Supply

A power supply failure would be indicated by the loss of all data channels from Windless Bight. It is possible either that all channels would be lost at once (possibly a broken conductor), or that channels would be lost over a period of time due to dropping voltage (most likely a failure of the 24v power conditioner). If the power supply failure is intermittent, it could be due to a temperature related intermittent connection between the RTG unit and its output cable.

A supply of 12v lead-acid batteries is kept on hand for use as a temporary power source in the event of power supply failure. There are spare components for the 24v power conditioner in the Infrasonics lab.

A power supply failure at Windless Bight must be approached with extreme caution. If the RTG unit has been disconnected from its load for an extended period of time, there is the possibility that the radioactive shielding has been damaged. Under no circumstances should the hut be approached or entered without first doing a radiation survey with the RADIAC. All personnel should be issued dosimeters. If the RTG is to be left disconnected from its load, it should be connected to its shorting plug (which is kept in the hut).

6.1.2 Oscillator

The failure of an oscillator will cause the loss of the audio tone or cause the tone to be weak or distorted. Often this will be due to a cold solder joint or an insufficient connection between the oscillator center conductor and the microphone capsule. The center frequency of the oscillator should remain nearly constant over a long period in time. Should that center frequency change suddenly, the oscillator is most likely malfunctioning. In some cases the audio tone will not be audible at the lab, but will be audible from the receiver output at the receiver site. This is the most conclusive distinction between an oscillator failure and other types of failures.

6.1.3 Acoustic Filter

An air leak into the acoustic filter will cause that channel to appear much "noisier" than the other channels most of the time. This type of fault usually occurs in January just after the filter pipes have been relocated onto the snow surface, and become subject to expansion from solar heating. The solution is lots of RTV goop on the end caps and Tee connection.

6.1.4 Land Lines

A land line failure will show itself as the loss of a single channel. There would be no tone present at the lab or at the receiver site. At the RTG hut, the ammeter for that channel would read zero rather than its normal 19ma. If the tone is present, and quite strong, at the receiver site, but is not present at the lab, then the land line from the receiver site to the lab is very likely broken.

There is approximately one mile of spare cable stored by the outhouse at the lab, and an additional quarter-mile stored in the RTG hut. None of this cable has connectors on the ends. If it is necessary to replace the cable between the receiver site and the lab, it will only require a lot of hard outside labor. If there is a broken cable at Windless Bight then the repairs will be extremely difficult. Only the cable runs to AUR and VEE are less than 1 1/4 miles. In any other case it will necessary to determine which portion of the cable run contains the break, and replace that portion. Cable runs were laid as follows: 1981: AUR, VEE, ROS; 1983: NOV; 1984: TER, ERE. Cable runs to ERE and TER laid in 1976 are still connected to the microphones and need only to be connected to the regulator panel in the hut if the new land line develops a fault.

6.1.5 Radios

A transmitter failure would be evident by white noise in place of the normal audio tone. This would indicate the absence of the FM carrier. It may be determined that the carrier is present by listening for a difference in the receiver output with and without the receiver antenna connected. A less likely failure would be the presence of a good tone at the regulator panel in the hut, but the absence of any signal at the receiver site. It may be difficult to determine whether a fault in the radio link is in the receiver or transmitter, but since both of them must be replaced (as well as the antennas) it doesn't really matter. There is also the possibility that the fault lies in the antenna cable. This is likely the case if replacing the radios and antennas does not solve the fault.

6.2 Failures in the Lab

6.2.1 Demodulators

If the audio tone in the lab is good, but the graphic output is not, then the problem most likely lies in the discriminator card. Frequent spike impulses (particularly associated with physical impact to the card cage) would indicate a poor connection on some component (possibly one of the large capacitors) of the discriminator. Failure of the discriminator to track a good audio tone indicates a problem with the phase-locked loop. A small adjustment to potentiometer F-1 on the bottom of the card edge may bring the loop into tracking. If however the discriminator continues to lose the signal, then the phase-locked loop chip should be replaced. For additional information, see the chapter on the demodulators.

6.2.2 Digital System

A failure within the digital system will most likely by reported by some kind of error message. Common problems such as tape transport off-line will be indicated by english-like messages at the terminal. Flashes of light can cause the tape transport to simulate a broken tape condition, thence putting it off-line. Hardware failures during data acquisition may be indicated by a FORTRAN OTS message, such as "?Err 12" (less serious) or by system crashes, indicated by a six digit octal value followed by an "@" prompt (more serious). In the former case, consult the System Message Manual in RT-11 Volume 2. In the latter case, the octal value is an indication as to where in software the failure occured. In either case, try reloading the program from tape. If the failure does not repeat itself, fine. If it does, then it is probably a hardware failure.

Using the link map for RTG8CH, and the octal value given by a system crash (processor halt), determine which routine was being executed when the failure

occured. The octal value is the address of the next instruction to be executed. The link map gives starting values for each program section or global entry point in the program. The octal address minus 2, minus the program section starting address gives the offset into the routine to the instruction where the crash occurred. If the routine is MACRO, then the offset for each instruction is the first column of six digit values in the routine listing. If the routine is FORTRAN, then a listing of the generated MACRO code for that FORTRAN routine can be made with the monitor command .FORTRAN/LIST/SHOW:4 filnam. If the octal address is greater than 160000, then the fault occurred while trying to interface a peripheral. Peripheral addresses used by RT68CH include:

177560-177566	Serial Line to Console Terminal
177000-177006	A2D Converter
172520-172532	Magtape Controller
160770-160776	TCU-50 Clock

This information should get you started on finding and replacing any faulty component of the system. For additional information, see the appropriate hardware manuals or the appropriate sections of this manual. Good luck.

Chapter 7

ANALOGUE EQUIPMENT

7.1 Sensors

The infrasonic sensor consists of five parts: the acoustic filter, the calibrator, the microphone capsule, the oscillator and the microphone can. The filter, calibrator and oscillator are easily detachable from the can, but the capsule fitting is sealed with RTV silicone paste and should not be removed unless absolutely necessary.

The acoustic filter is a 300 foot long, 2 inch diameter black PVC pipe with a 0.074 inch hole drilled in it every five feet along the length of the pipe. A TEE connection at the center of the pipe, and a short length of hose, connect the filter to the microphone can. The end caps and the center connection of the pipe must be disconnected each year when the sensor is disassembled and moved to the new surface of the snow. Upon reassembly, all connections must be sealed with RTV paste.

The calibrator consists of a valve and a bellows, each driven by its own electric motor. The bidirectional valve motor allows the valve to be moved to an open or closed position as necessary. When open, the valve allows air from the acoustic filter to pass to the upper side of the diaphragm in the microphone capsule. When closed, the acoustic filter is shut off from the system, and the bellows is opened to both the upper side of the diaphragm and to the plenum (the air surrounding the backing volume). The size of the plenum directly affects the amplitude of the calibration waveform, so the calibrators cannot be moved from one can to another without some loss in the calibration accuracy. A mechanical stop prevents the bellows motor from being driven the wrong direction. The two motors are controlled by a calibrator control box, which is described in the System Calibration chapter.

The microphone capsule is simply a capacitive diaphragm. The lower side of the diaphragm is open through the capsule fitting to a backing volume in the lower two-thirds of the can. The upper side of the diaphragm is open to a hose fitting on the side of the capsule. A short length of plastic tubing leads from this fitting to the calibrator. A coil of small metal tubing serves as a slow leak across the diaphragm to compensate for changes in barometric pressure. The microphone capsule is quite delicate, and should be protected from thermal and mechanical shocks.

The oscillator is a 6 inch by 6 inch printed circuit board in an aluminum housing. It is physically and electrically connected to the capsule by three banana plugs (ground) and a center contact. A 2 conductor connector mounted on the oscillator housing is used for connection to the land line leading to the electronics in the RTG hut. The nominal oscillator frequency is 1500 Hz (with the capsule at its nominal capacitance of 100 pf). Figures 1, 2 and 3 show the oscillator schematic, board layout, and parts list respectively.

7.2 Regulator Panel

The regulator panel provides power distribution, and signal separation for the electronics at Windless Bight. The 24 volt DC output from the power conditioner is dropped to the appropriate voltage to provide 12 volts across the oscillator (after line losses). A milli-ammeter is provided for each channel, and a current of 19 ma insures 12 volts across the oscillator. The audio tone is separated from the DC voltage and directed to the transmitter input. This tone may be checked using the black and orange test points. The maximum allowable signal is 1.0 volts RMS AC. This is adjustable with the 1k audio gain pot. The 12 volt DC output from the power conditioner is used to supply power to the transmitters. Figures 4, 5 and 6 show an overall schematic, a schematic for the voltage regulator subassembly and a board layout, respectively.

7.3 Power Conditioner

The power contitioner is used to convert the 2.4 volt RTG output voltage to useful levels. The power conditioner outputs are designated as +12, -12 and Common; however they are used in our application as +24, +12 and Ground. The red output wire is +24, the white wire is +12 and the black wire is Ground. As it has not been possible to acquire a spare power conditioner, a complete set of spare components is on hand in the Infrasonics Lab, should it become necessary to reconstruct the unit. Figures 7 and 8 show a parts list and a schematic, respectively.

7.4 Receiver Power Supply

The receivers are powered by a 12 volt card supply located in the infrasonics lab, and connected to the receivers by a run of spiral four cable from the lab to the receiver site. Figure 9 (2 pages) is the manual for the card supply.

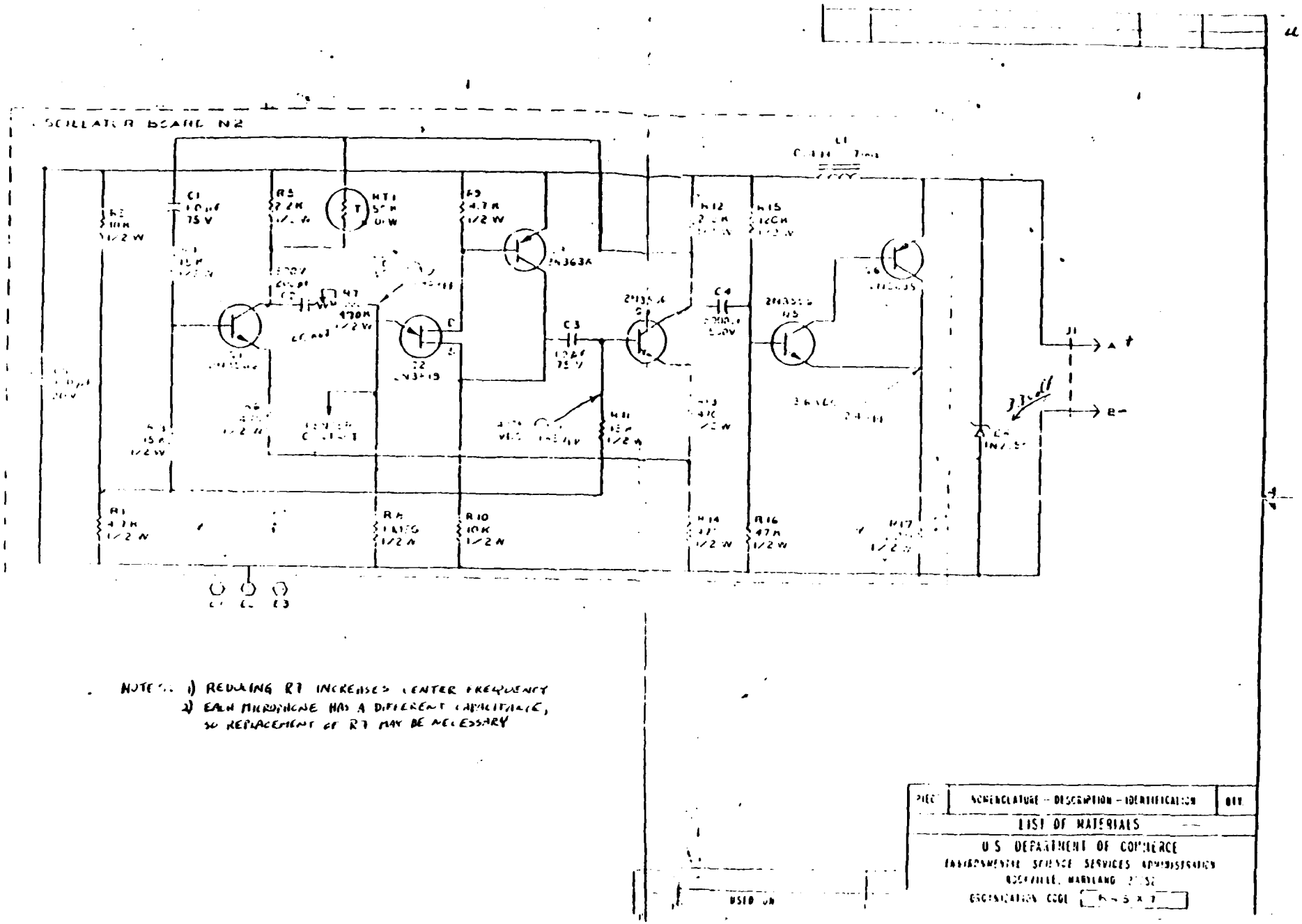


Figure 1. Oscillator Schematic

C1	Capacitor 1.0 μF, 75 V, 10%			E4	Contact
C2	Capacitor 200 pF, 500 V, 1%	[illegible]		E5	Standoff
C3	Same as C2			E6	Same as E5
C4	Capacitor .005 μF, 500 V, 10%	[illegible]	[illegible]	E7	Same as E5
C5	Capacitor, 100 μF, 20 V, 10% Solid Tantalum	CS13[illegible]107K			
Q1	Transistor	2N3546			
Q2	Transistor	2N3819			
Q3	Transistor	2N3638			
Q4	Same as Q1				
Q5	Same as Q1				
Q6	Same as Q3				
L1	Inductor, 0.4 H, 7 mA	[illegible]L-2	80223		
R1	Resistor, 4.7 kΩ, 1/2 W, 5% composition	RC20GF472J			
R2	Resistor, 10 kΩ, 1/2 W, 5% composition	RC20GF103J			
R3	Resistor, [illegible] 1/2 W, 5% composition	RC20GF[illegible]			
R4	Same as R3				
R5	Resistor, 2.2 k, 1/2 W, 5% composition	RC20GF222J			
R6	Resistor, 470 Ω, 1/2 W	RC20GF471J			
R7	Resistor, 499 kΩ, 1/2 W, 1% composition	RN20x4993F			
R8	Resistor, 1 MΩ, 1/2 W, 1% composition	RN20x1004F			
R9	Same as R1				
R10	Same as R2				
R11	Same as R3				
R12	Same as R5				
R13	Same as R6				
R14	Same as R6				
R15	Resistor, 120 kΩ, 1/2 W, 5% composition	RC20GF124J			
R16	Resistor, 47 kΩ, 1/2 W, 5% composition	RC20GF473J			
R17	Resistor, 220 Ω, 1/2 W, 5% composition	RC20GF221J			
RT1	Thermistor 50k, 0.01	[illegible]	15301		
	Clip, Fuse		75915		

Oscillator Board [illegible]

Figure 2. Oscillator Board Layout

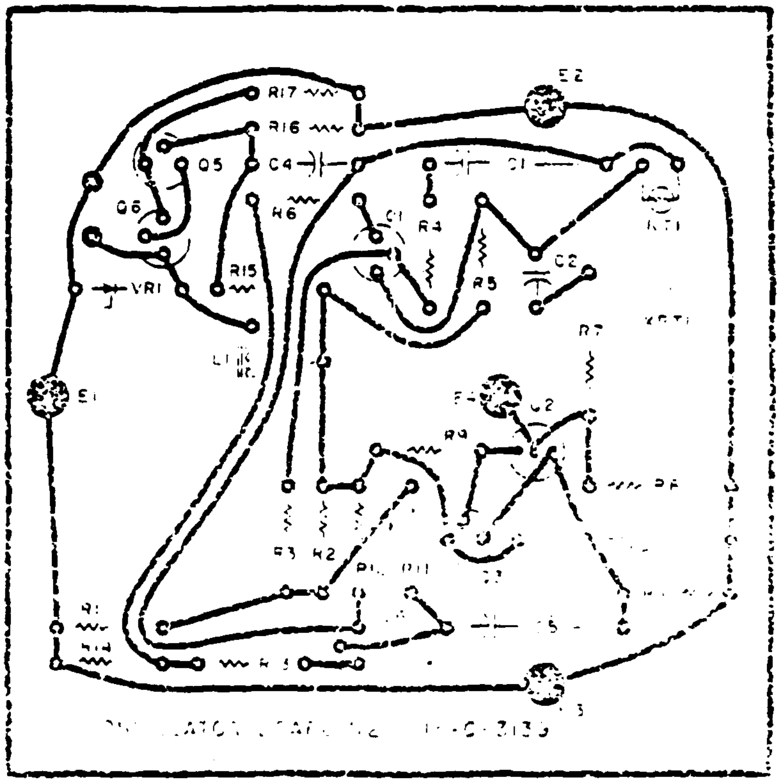


Figure 3. Oscillator Parts List

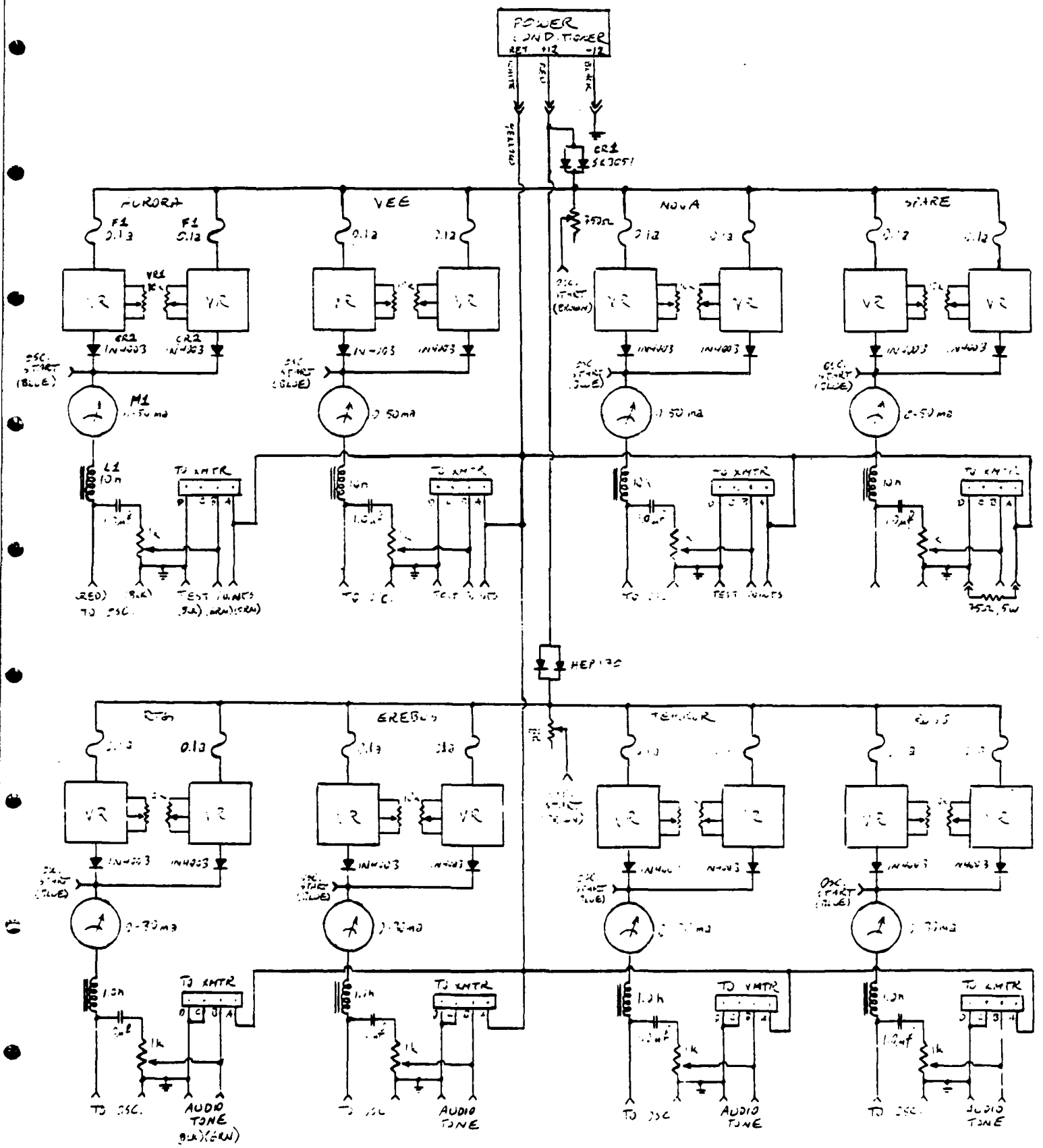
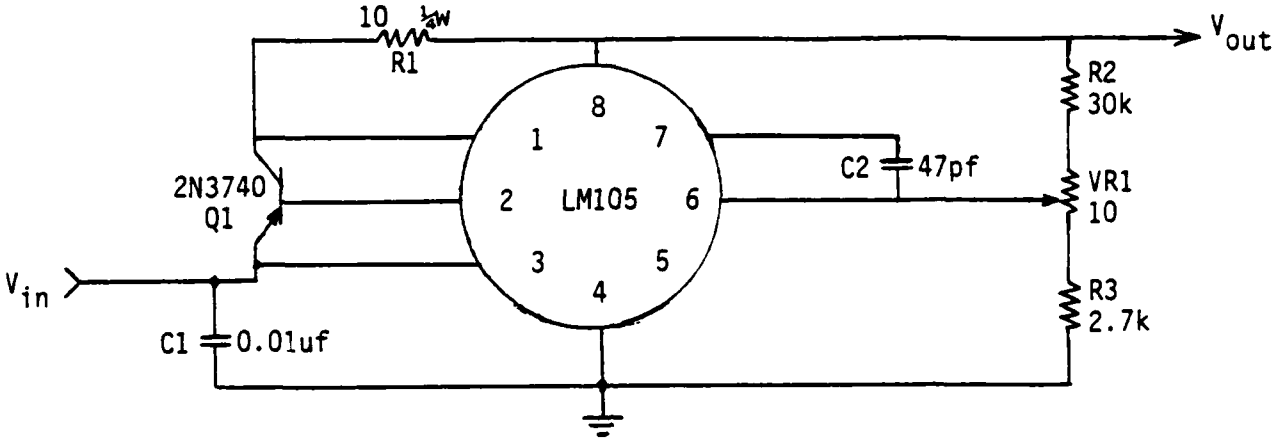


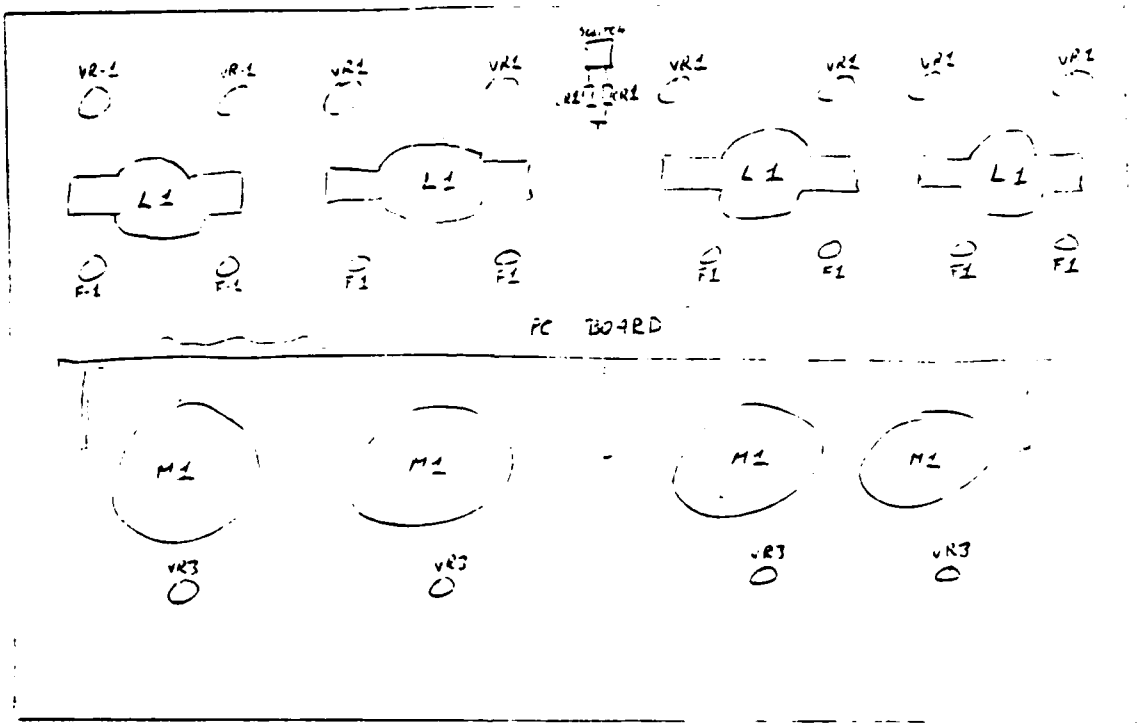
Figure 4. Regulator Panel Schematic



Notes:
1. With a nominal voltage of 24v for V_{in}, the output voltage range is 6.0v to 21.7v.
2. With V_{in}=24v and V_{out}=12v the maximum current I_{out} is 40ma.
3. With V_{out}=12v across a 666 load, I_{in}=20ma and I_{out}=18ma.

Figure 5. Voltage Regulator Subassembly Schematic

Regulator Panel Parts Layout



P.C. Board Parts Layout
(Single Channel)

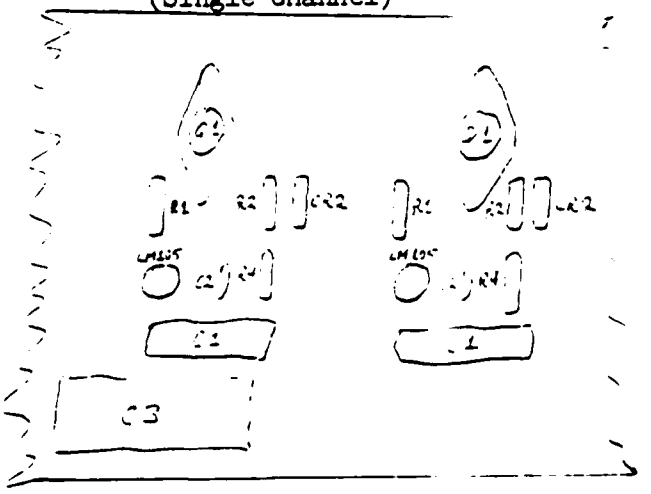


Figure 6. Master Regulator Panel Parts Layout

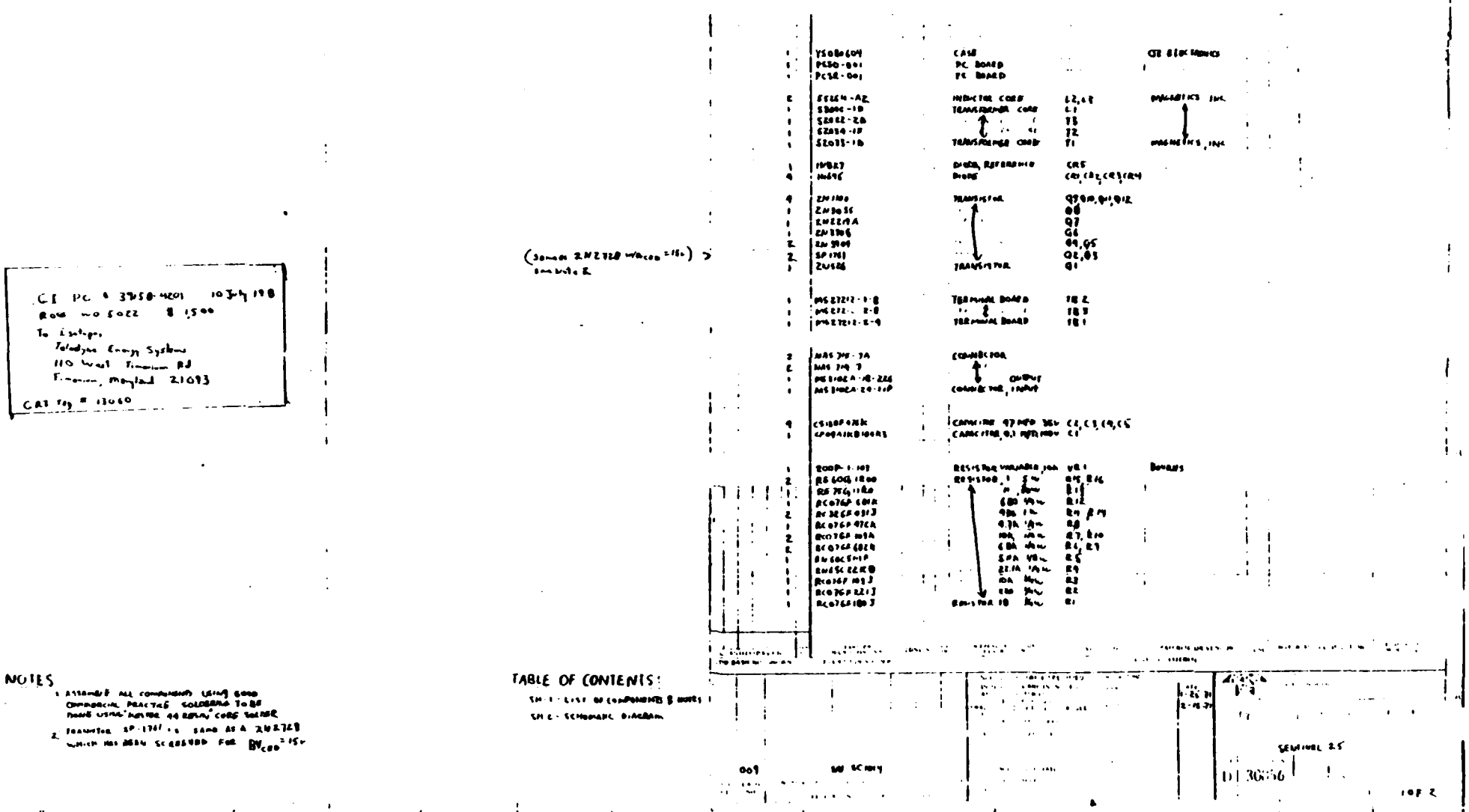


Figure 7. Power Conditioner Parts List

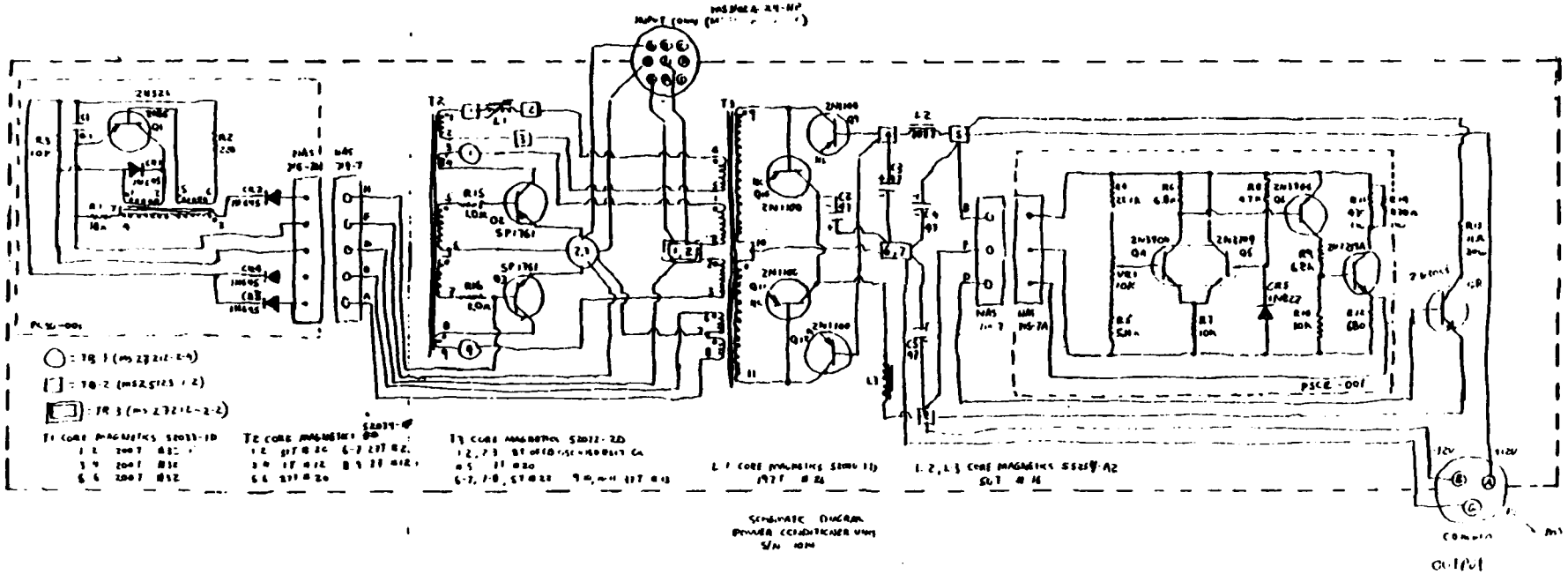
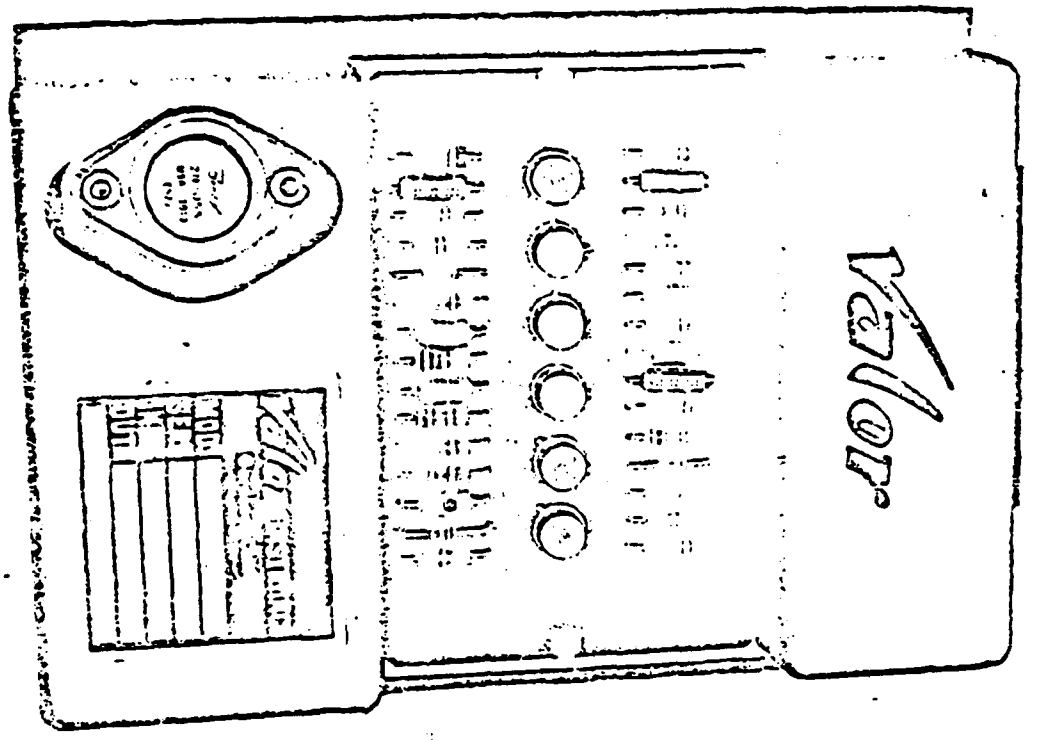


Figure 8. Power Conditioner Schematic



CS 115 - 0.4

Valor Instruments, Inc.

CARD SUPPLY MANUAL

Figure 9.

ELECTRICAL SPECIFICATION

INPUT: 105 to 125 VAC, 50 to 400 cps.

OUTPUT: 0-15 VDC @ 0-400 ma.

LINE REGULATION: 2 mv Max. for 10% change.

LOAD REGULATION: 0.02% typical 0.05% Max. or 1 mv whichever is greater.

RIPPLE & NOISE: 0.05 mv typical 0.5 Max. (RMS)

TRANSIENT RESPONSE: 50% to full Load recovery time 10 microseconds typical, 25 microseconds Max.

TEMPERATURE: OPERATING TEMPERATURE: - 20°C to + 60°C.

REMOTE ERROR SENSING: Remote Voltage Sensing connections provided.

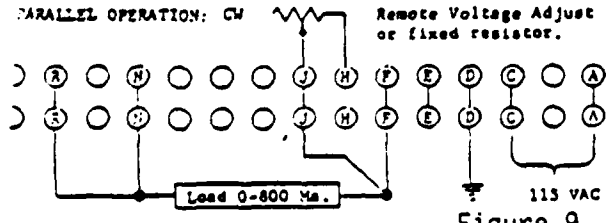
REMOTE PROGRAMMING: 200 ohms per volt for fixed output or 3 K pot for full voltage adjustment.
(Pre-set voltage available from factory)

ISOLATION: 1000 megohms minimum @ 500 VDC.

POLARITY: Floating either positive or negative may be grounded.

OVERLOAD PROTECTION: Electronic short circuit protection with automatic recovery.

PARALLEL OPERATION: CW

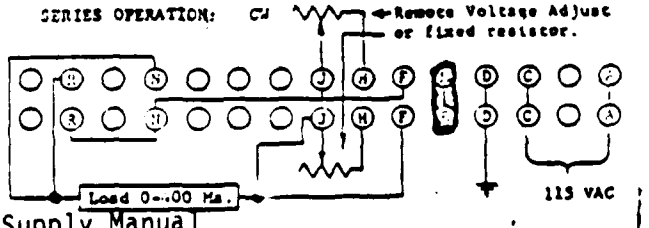


ELECTRICAL AND MECHANICAL PARTS LIST

Q1, 2 & 3	Valor (Similar to 2N2060)	VALOR-1
Q4, 5 & 6	RCA	2N697
Q7	Westinghouse	2N3055
CR1	Continental Devices	CD36722
CR2 & 3	Continental Devices	1N752
CR4 thru 9	Diodes, Incorporated	TS1
C1, 2 & 3	MS Sencor (TS2-15)	15MFD @ 20VDC
C4 & 7	Cornell-Dubilier	500MFD @ 15VDC
C5	Cornell-Dubilier	50MFD @ 50VDC
C6	Cornell-Dubilier	50MFD @ 15VDC
C8 & 9	Centralab	.05MFD @ 50VDC
T1	Valor	PE47E
PC1	Laurence Industries	101[illegible]
DC1	Valor (Housing)	EB1123
Screws	6-32 NC by 1/4" R.H.	6 each require
Screws	6-32 NC by 1" R.H.	2 each require
Screws	4-40 NC by 5/8" R.H.	2 each require
Washers	No. 6 LT-Lock Washers	8 each require
Washers	No. 4 LT-Lock Washers	2 each require
Insulator Mica .002" Ford		1 each require
Insulator Plastic, Transistor		2 each require

NOTE: Equivalent parts may be substituted.

SERIES OPERATION: CW



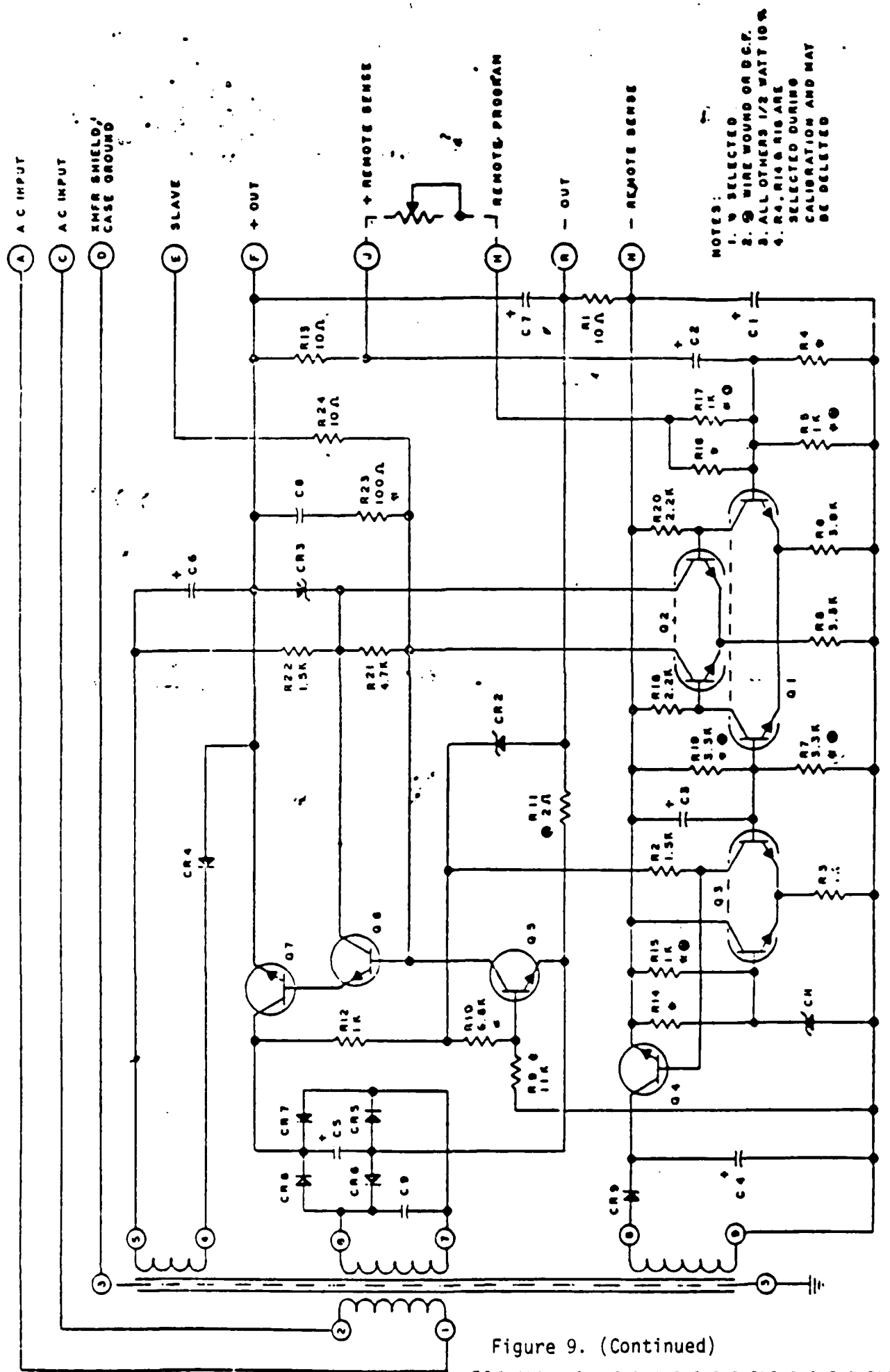


Figure 9. (Continued)

Chapter 8

DEMODULATORS

The audio tones from the oscillators in the sensors are a frequency modulated signal containing the pressure variation information from the sensor site. The demodulator system performs the tasks of extracting the modulated signal, filtering the signal with the desired bandpass, and amplifying the signal to a known standard. This is the heart of the analogue system.

There are two card cages, which are similiar in design. Each of these contains the demodulator electronics for one array. The upper card cage (serial WBA) is for the small (N-6) array, and the lower card cage (serial SCB) is for the large (N-7) array. Each array holds four discriminator cards (one for each channel) and a power supply card. To the right of the cards is a control panel which permits the inputs to be disconnected from the discriminator cards (for zero adjustment). In addition, the N-7 array card cage (SCB) holds a tape bias card which supplies the 200 Hz AC bias signal for the slow-speed analogue tape head. An overall schematic for a card cage is shown in figure, 1 along with a board layout for the discriminator cards. A schematic for the card cage power distribution is shown in figure 2.

The back of each card cage has three columns of banana plug pairs. These are outputs to tape (left), inputs (center) and outputs to the charts and A2D converter (right). There are four banana plug pairs in each column, one for each channel. The top set of plugs in each column in wired to the card slot farthest from the control panel, and so on. The N-7 array card cage also has a banana plug pair for the tape bias output, and another for the tape time mark input.

All of the demodulator electronics are contained on the discriminator card. There is one card for each channel. Schematics are shown in figures 3 and 4. The signal input for each channel is an audio tone in the range 1100 to 1700 Hz. An NE565 phase-locked loop is used to demodulate this signal. The demodulated signal is then filtered by a two stage active filter to remove undesired components. This filter is designed to be flat within 1.5 dB throughout the passband of 10 seconds to 67 seconds period for the N-7 array or 1 second to 10 seconds period for the N-6 array, when calibrated for full scale with a 15 second (N-7) or 5 second (N-6) period calibration signal. The filter output is amplified to drive the chart recorders and A2D converter. This output is also additionally amplified to create a suitable output to the analogue tape.

When in normal operation, the toggle switch (SW-1) should be in the RUN position. On older cards this is the down position, but on the newer cards

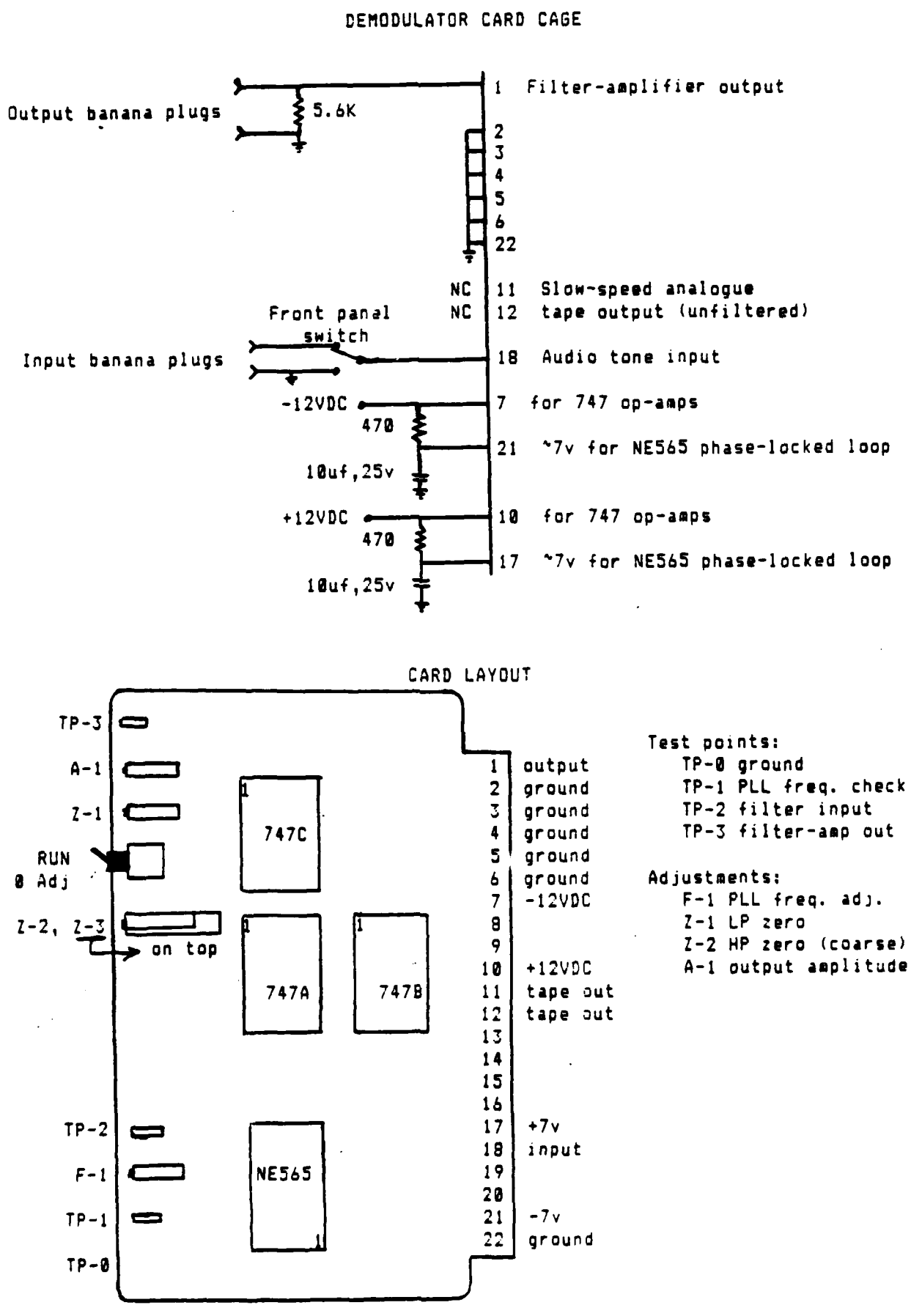


Figure 1. Card Cage Schematic and Demodulator Board Layout

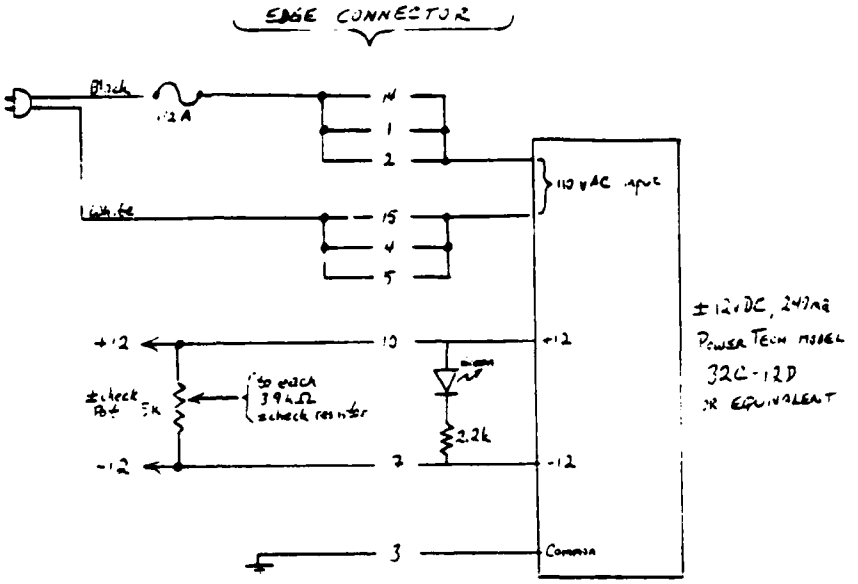


Figure 2. Card Cage Power Supply

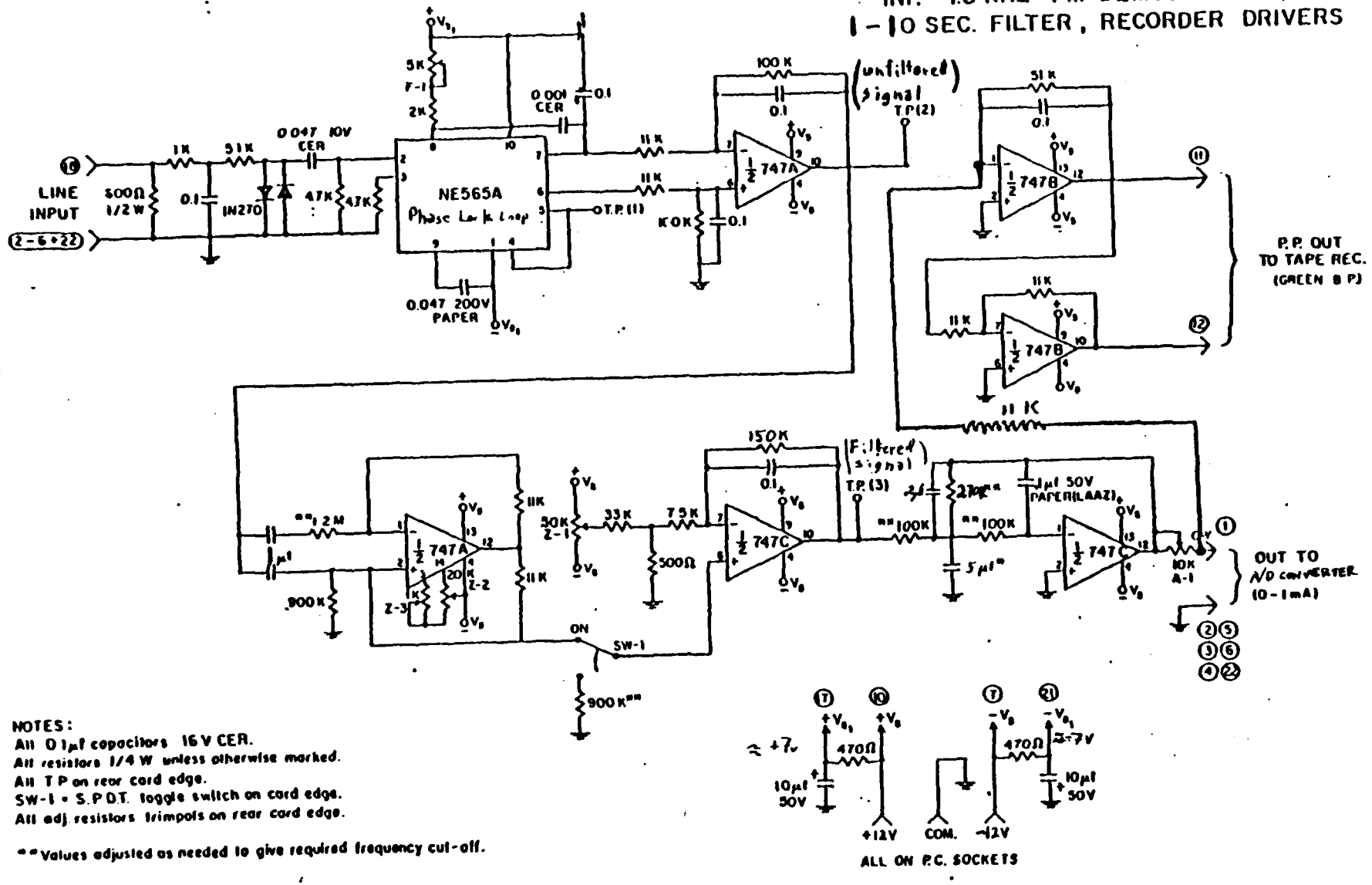


Figure 3. N-6 Demodulator Schematic

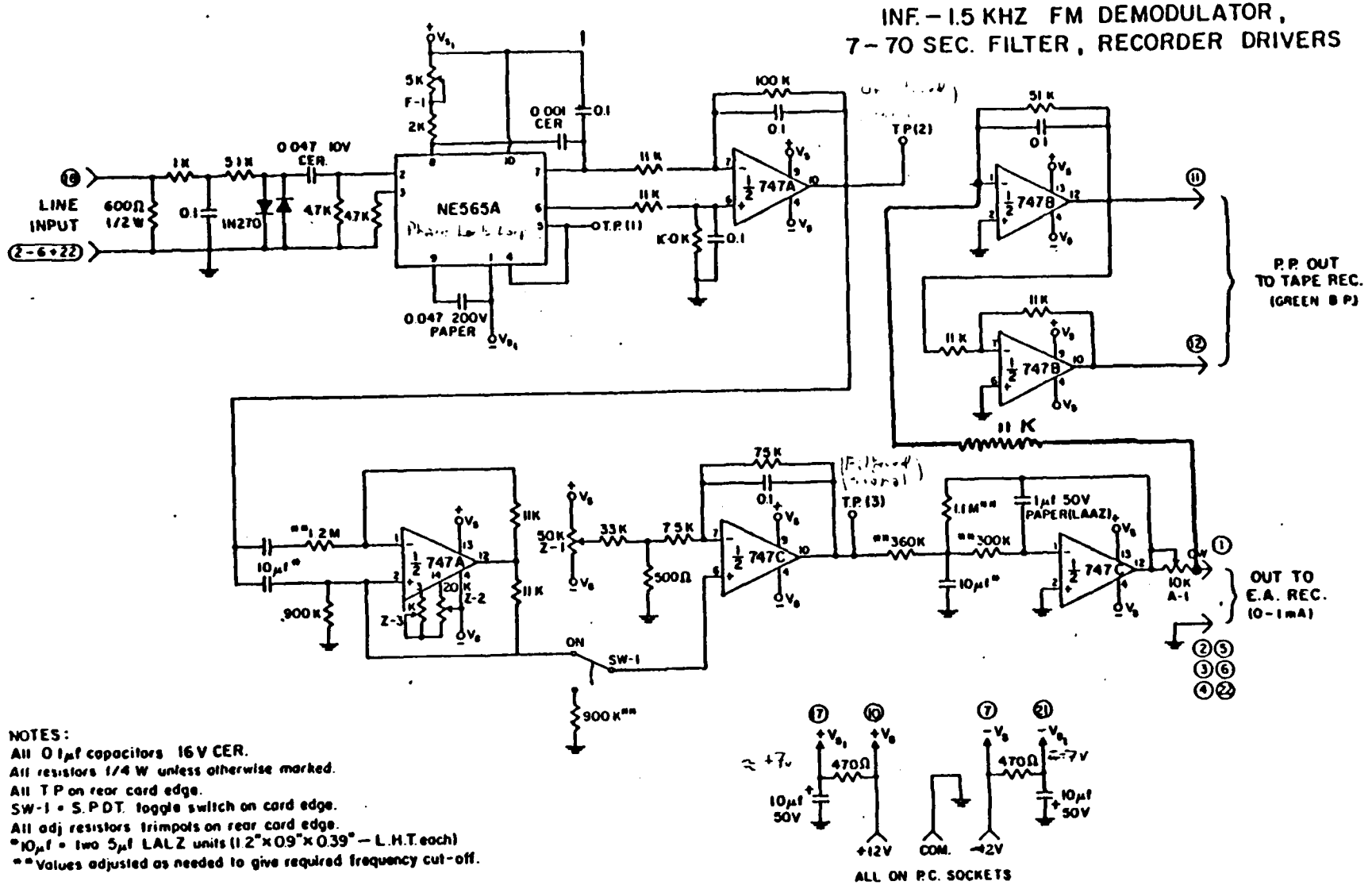


Figure 4. N-7 Demodulator Schematic

this is the up position. All of the newer cards are appropriately marked. The right panel knob(s) should also be in the RUN position. The +/- CHECK position lets the unit run, but connects the chart recorders and A2D converter to a variable voltage source. This is adjustable by the right panel control which allows the pens to be moved to full scale for alignment checking. Note: A +/- CHECK should never be done when the A2D converter is sampling. The INPUT GROUNDED position of the right panel knob disconnects the filters from the demodulated signal, allowing the output to settle for zero adjustment.

Zero adjustments should be checked whenever a calibration is performed. See the System Calibration chapter for the zero adjustment and calibration procedure.

The discriminator cards will give a full scale output (+/- 0.5 ma into a 5.6 kOhm load) with a standard +/- 10 Hz frequency modulation of the audio tone at a 15 second (N-7) or 5 second (N-6) period. This is the standard signal provided by a 10 dyne calibrator. The calibration procedure is described in the System Calibration chapter.

Any failure common to all of the channels in a cage shows a problem with the 24 volt power supply. This is a plug in unit, easily replaced with one of the spares. A failure of one channel only is most likely a problem with the discriminator card for that channel. This is easily serviced by replacement with one of the spare cards.

Chapter 9

SLOW-SPEED ANALOGUE TAPE

The slow-speed analogue tape system is used as a backup to record the large (N-7) array information. 7 tracks of an IRIG standard interleaved 14-track, 1 inch tape are recorded at a speed of 1/4 inch per minute. Six of the seven tracks are used. Track 1: records the timing marks, track 5: the output from RTG N-7 divided by 10, track 7: the output from Ross, track 9: the output from Terror, track 11: the output from Erebus and track 13: the output from RTG N-7 The tape transport itself is quite simple, and contains nothing more than the tape path, motors and tape head.

The record amplifiers for the tape are included as the final stage of the discriminator cards (see the Demodulator chapter). They are essentially a pair of impedance matching amplifiers.

A record head bias signal is also necessary to activate the head. This is supplied by the tape bias card mounted in the SCB card cage. A schematic is shown in figure 1, and the card edge connections are shown in figure 2. Q1 and Q2 are connected to form a free running multivibrator with a frequency of about 200 Hz. The exact frequency is not critical, however amplitude and waveform stability are critical for minimum recorded noise and maximum dynamic range. Q3 through Q6 form the output driver for the bias windings of the record head. These four transistors act as a reversing switch driven by the oscillator. R1 and VR1 establish 10v across the switch so that the unloaded output is a symmetrical square wave of about 20 volts peak to peak. the resistance of the bias windings with R10 reduces the output square wave to about 2 volts peak to peak while the inductance of the head windings causes a spike of about 12 volts on the leading edges of the square wave.

Between the electronics and the tape head is a monitor panel consisting of several ammeters. A monitor schematic is shown in figure 3 and the head schematic is shown in figure 4. For each track there is a +/- 100 microammeter with a shunt resistor. When the system is properly connected the output of a record amplifier is series connected through a monitor meter, the signal winding of the record head, and back to the output of the companion amplifier. The shunt resistors for the meters have been selected so that the proper recording level on the magnetic tape is obtained when, during a system calibration, the meter deflection is 5 microamps peak to peak for each microbar peak to peak produced by the calibration signal.

There is a friction clutch between the take-up motor and take-up spindle, which is disassembled by removing the tape-up motor. The clutch consists of an aluminum cup fastened to the motor shaft. In this cup a split cylinder has

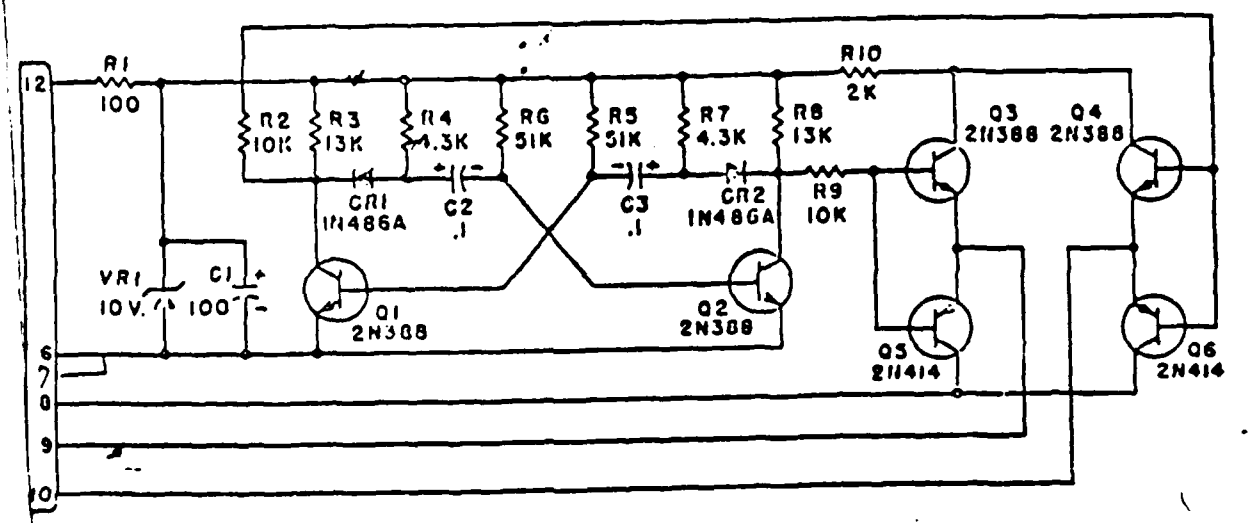


Figure 1 Bias Supply Card N1, Schematic

Rear Edge Connector
Tape Bias Card
Infrasonics Discriminator Panel s/n# SCB

connector pin #	use
4	ground
7	to Bias adj. meter (black BP) and Bias adj. pot.
13	ground
15	to Bias adj. pot.
17	to Bias adj. meter (yellow BP)
19	to tape deck bias head
21	to tape deck bias head
24	+12v power
25	+12v power

note: card has different numbering system

card pin#	connector pin #	external connections
6	4, 13	
12	24, 25	
7	15	
3	7	
8	17	
9	19	
10	21	

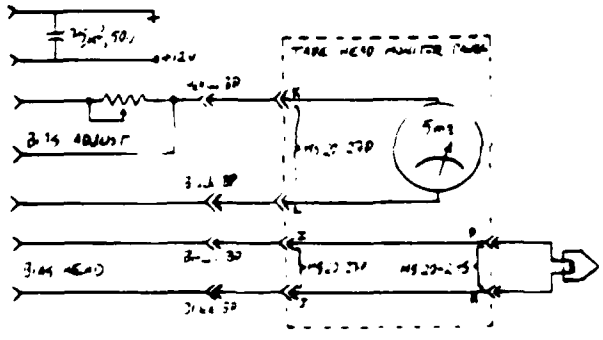
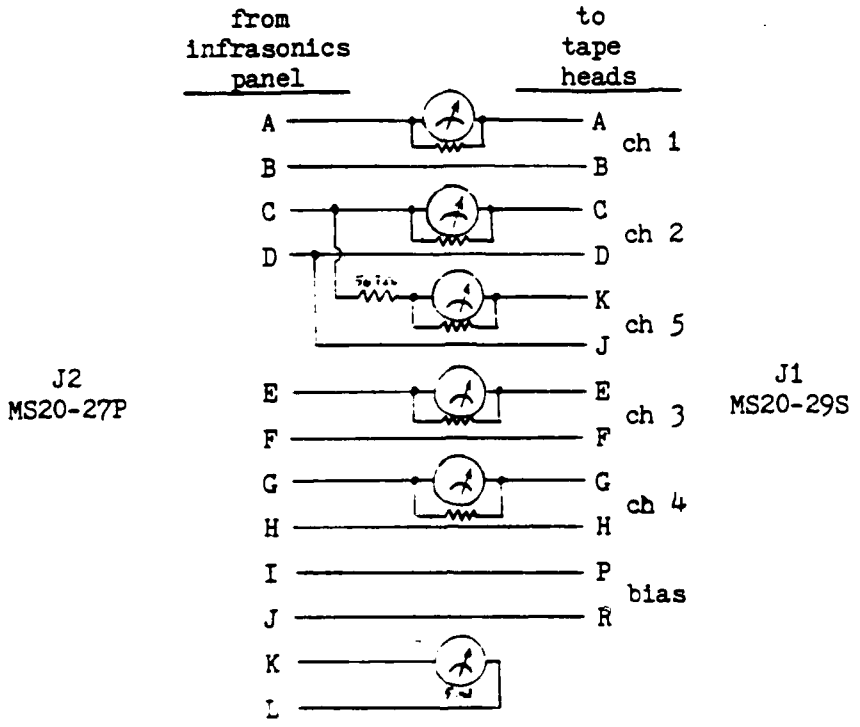


Figure 2. Bias Card Connection

N2-SCB Slow-Speed Tape Recorder
Head Current Monitor Panel



Meters read 1ma full scale with shunt of 46 ohms
Meter ch5 is ÷10 of ch2
Meters are Martin Instruments/Honeywell # HMR25W1H1DCUA (±100ua)

Figure 4. Monitor Schematic

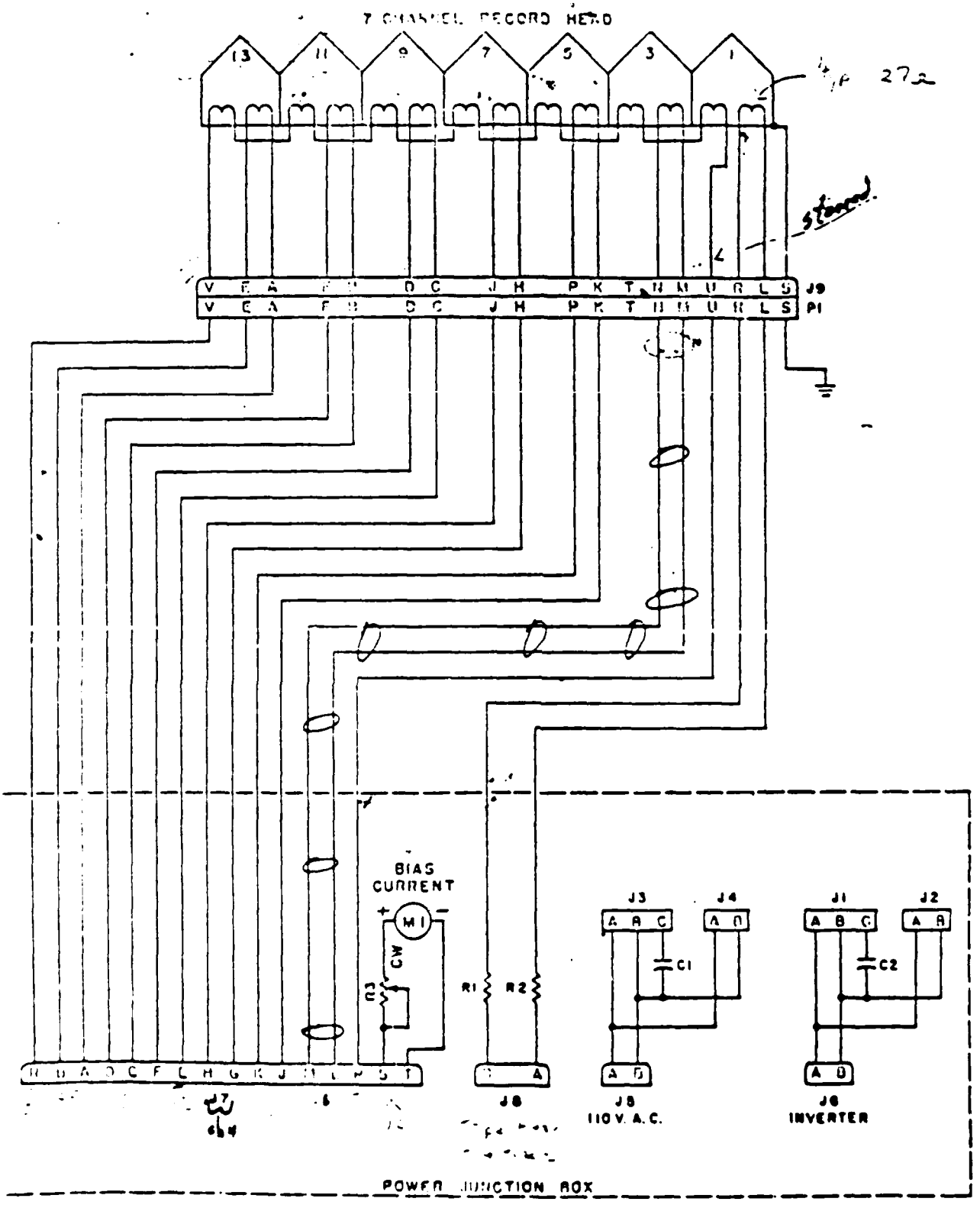


Figure . Power Junction Box, Schematic

an O-ring at its circumference. Four flat-head screws hold the split cylinder together and, when tightened, push the O-ring so as to increase its diameter and thus increase the friction. The four screws should be tightened or loosened together. The clutch works best with a thin film of silicone grease. The ideal adjustment of this clutch is to have it tight enough to hold the tape on the reel whether full or empty. In no case should the tension provided by the take-up clutch be sufficient to pull the tape past the main capstan and pressure roller. Once properly adjusted, the tension should remain stable for years.

Time marks are recorded on track 1 of the tape according to the following scheme. A ten second mark is made each five minutes, with a twenty second mark on the hour. Each time mark consists of a 1/2 Hz square wave. The time mark generating equipment consists of a Systron Donner model 8210 clock and a time code generator/relay box. These are described in the Digital Equipment chapter.

Chapter 10

DIGITAL EQUIPMENT

10.1 Time Mark Systems

10.1.1 EA Recorder Time Marks

Time marks for the EA recorder charts are written on both margins of each chart in IRIG D slow code. A Datum 9100 Time Code Generator produces a TTL compatible IRIG D code signal which is used to drive a relay that switches the 120 vac power to the side pen inputs of the EA recorders. An LED on the relay box indicates when the 120 vac signal is activitated.

10.1.2 Analogue Tape Time Marks

The time mark signal for the analogue tape is provided by a Systron Donner 8210 clock and a GI built time mark generator box. This time mark generator box uses a number of the TTL compatible output signals from the SD8210 clock to produce three output time codes. The first output code is a 4 second mark every minute with a 20 second mark on the hour. The second code is a 1 second mark every other second for 10 seconds every five minutes, and a 1 second mark every other second for 20 seconds on the hour. The third code is simply a 20 second TTL compatible mark on each hour. The second output code is used for the analogue tape. Figure 1 shows the schematic for the time mark generator box.

10.2 Digital System

10.2.1 Computer Configuration

There are two independent computers in the Infrasonics Lab. The first is a dedicated system for the collection and real-time analysis of infrasonic data. The second is intended for general use, including data analysis, message preparation and any other needs. The second system is also intended to be available as a backup should some major component of the data acquisition system fail. Some reconfiguration of the second computer would be necessary before it would be possible to use it with RTG8CH for data

Infrasonics Time Mark Generator
for use with
Systron Donner model 8210 digital clock
(30 Nov 78 JWK)

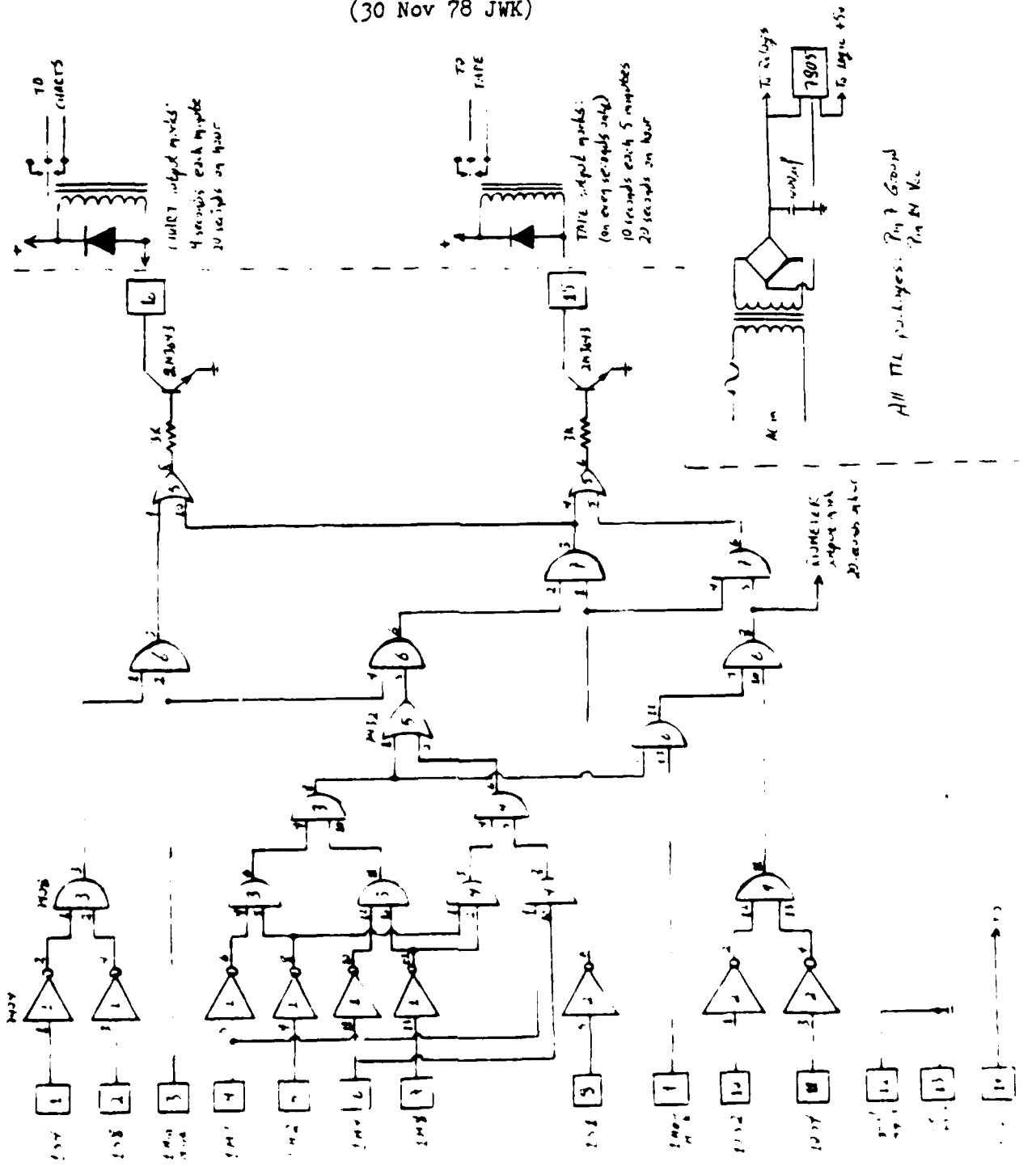


Figure 1. Time Mark Generator Schematic

collection. Details of the configurations of all components in each computer system are described in Appendix B.

10.2.2 A2D Trigger

The A2D Trigger provides the 4 Hz signal that initiates the A2D converter's sampling of the infrasonic data. This module is GI built on a W941 wire wrap board for the LSI-11 bus. Very simply, the output from a crystal oscillator is run through the appropriate divider stages to produce a 4 Hz, 450 ns pulse, TTL compatible output. The module uses only the power supply from the LSI-11 bus, and therefore should be installed in the right half (slots C-D) of the backplane. The 4 Hz signal is available from a shielded cable which is connected to the A2D converter input. Figure 2 shows a schematic, and figure 3 the board layout for the A2D trigger.

10.2.3 Printers

The printer for the data acquisition system is used to print more than five million lines per year, and this use requires a fair amount of maintenance. In particular, print heads and platens are frequently in need of repair or replacement. A large inventory of spare parts is maintained for the IDS-440 printers, and three complete printers (plus one printer that is unusable) are owned by the project. The intention is for two of the IDS-440 printers to be on station at all times while a third may be returned to the manufacturer for reconditioning.

Broken print needles may be replaced without removing the entire print head from the unit. Four screws hold the front panel to the main chassis of the printer. By removing the top two screws, and loosening (but not removing) the bottom two screws, the print head may be moved away from the platen, allowing sufficient room to work. Removing the ribbon inking rollers exposes two access holes through the front panel. By moving the print head manually, the four screws that hold the print head to the carriage assembly may be loosened. The upper print head screws are standard, while the lower screws are phillips head. Once the back of the print head is exposed, the broken needle may be replaced by removing its brass cover plate, taking out the old needle (usually in three pieces), placing an unbroken needle in position and replacing the brass cover plate. Unbroken needles may be pirated from other used print heads.

Whenever the print head is repaired or replaced, the platen should be inspected for wear. A damaged platen will reduce the life of the print needles as well as the ribbon. Most of the time a platen may be reused by turning it over. Platens may be resurfaced by sanding or milling the face smooth. Do not follow the procedure for platen adjustment from the IDS-440 manual. Instead, reassemble the printer and start printing a test pattern. With a new ribbon in the printer, adjust the platen so that it is as far from the print head as possible, while still printing all characters clearly. This will help to extend the life of the platen.

Figure 2

A/D TRIGGER BOARD

The W941 A/D trigger module is a 4Hz trigger for the A/D converter's RTC (real-time clock) input. A schematic is shown below, and the board layout is shown on the following page.

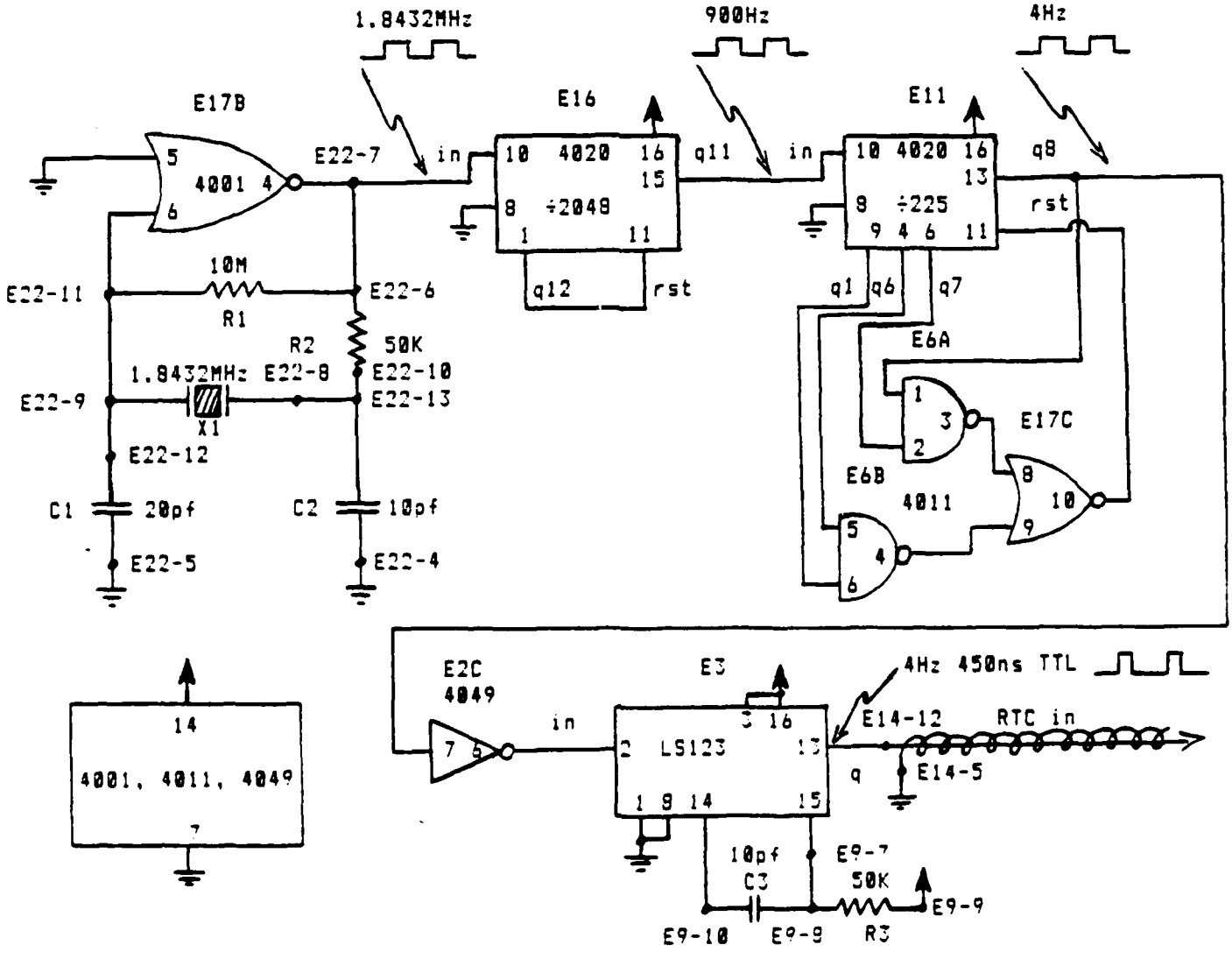
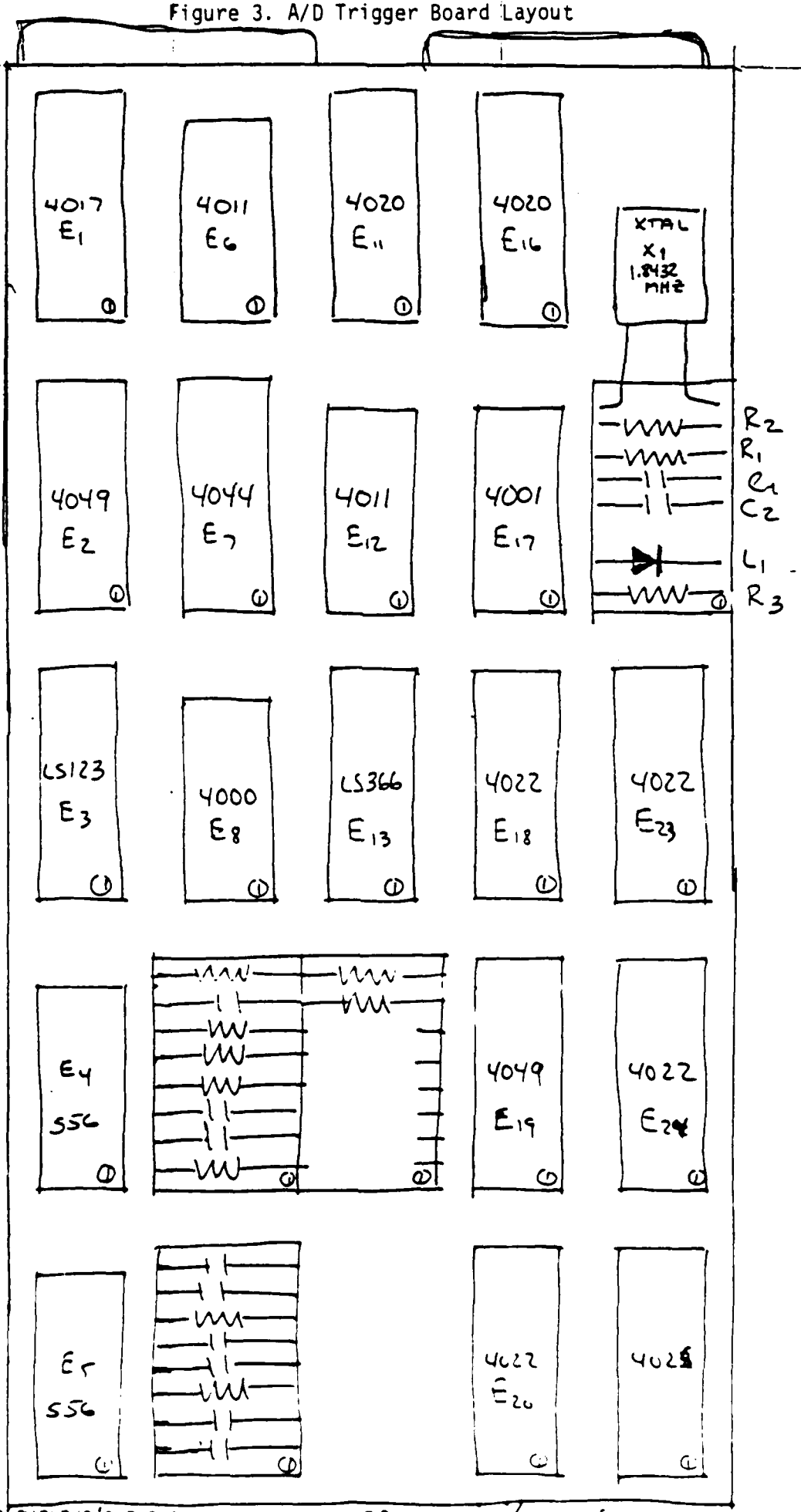


Figure 3. A/D Trigger Board Layout



The Epson printer is used for the offline analysis computer, as it produces a more pleasing output, and has a number of features not available on the IDS-440. There is a spare Epson printer, but there are not any spare parts.

10.2.4 Operator's Console

Each computer has one operator's console (video terminal). These are Lear Siegler ADM-3A "dumb" terminals capable of alphanumeric display only. However, additional electronics have been added to the operator's console on the offline analysis computer to emulate Tektronix 4010 graphics. These electronics are contained on one electronics card beneath the ADM-3A electronics card in the base of the unit. Manuals describing the graphics upgrade (RG-512 Retro-Graphics) are in *Equipment Volume 6*.

Chapter 11

WINDLESS BIGHT TO INFRASONICS LAB RADIO LINK

A two-way voice radio link is available for use between field parties at Windless Bight and the station operator in the Infrasonics Lab. This link is essential for the efficient performance of the system calibration and serves as a useful backup should the vehicle radio fail. Normally, the call signs Windless Bight and Little House are used. This link uses Motorola Micor radios transmitting at 135.6 MHz. (135.6 MHz is a satellite downlink frequency, so splatter from the satellite is occasionally heard.)

The radio for the Windless Bight party is contained in a box with a hinged cover, that may be carried in the back of the Spryte. An antenna mounted on a wooden mast may be mounted on the Spryte with a pair of C-clamps that are kept in the radio box. A separate box containing a 12 volt battery completes the system. Antenna and power cables extend through a port in the box lid.

The McMurdo station end of the link is housed in a small blue crate just a few feet from the road at the Infrasonics Receiver Site (1/4 mile from the lab). An antenna is mounted on a mast beside the crate. A run of spiral four cable carries the audio signal from the receiver site to a remote control station in the Infrasonics Lab. However, there is no provision for turning the radio on or off from the lab.

The control head and terminals for the McMurdo radio are contained in a box attached to the radio itself. Installation simply requires that the antenna cable, power cables and remote audio cable be connected at the receiver site. The audio cable is connected by banana plugs, which should be fastened with rubber electrical tape to insure that they do not become disconnected. Power is provided by 12 volt batteries (2 such batteries in parallel are recommended when the ambient temperture is less than -15 degrees Celsius). During the winter these batteries should be recharged daily.

When the system is not in use (during the winter), it should be disassembled and all parts (except the crate and antenna at the receiver site) should be stored in the lab. Most difficulties encountered with this system have been due to weak batteries at the receiver site. There is a spare Micor radio stored in the lab. Complete documentation for the Micor radios is available in *Equipment Volume 3*.

Appendix A

SYSTEM SPECIFICATIONS

SYSTEM SPECIFICATIONS AT WINDLESS BIGHT

Sensors

Transducer can	Model N4
Calibrator box	Model N5 modified by GI
Microphone diaphragm	Model N2
nominal capacitance	100 pf
Oscillator	Model N2 type, GI built
nominal current	19 mA
Acoustic filter	300' x 2" dia PVC pipe
	0.074" holes spaced at 5'
Land lines	CX1065/G Spiral Four

Sensor stations — Surveyed January 1983

		x = 0.0m	y = 0.0m	
#0	RTG N-7	x = 0.0m	y = 0.0m	lines installed 1976
#1	Erebus	-2480.0	5726.0	lines installed 1984
#2	Terror	5352.0	3132.0	lines installed 1984
#3	Ross	3761.0	-1013.0	lines installed 1981
#4	RTG N-6	0.0	0.0	(duplicates #0)
#5	Aurora	-34.9	1123.0	lines installed 1981
#6	Vee	924.3	583.4	lines installed 1981
#7	Nova	1027.5	1987.7	lines installed 1983

Power supply — Radioisotope Thermoelectric Generator

Model	LCG-25C
Serial Number	RTG-006
Output	2.4 VDC
Power (01DEC67)	38 watts
Power (26NOV84)	15.0 watts
Suggested replacement	January 1988
Power conditioner	PCU-001-5004
Serial Number	SC1014
12 VDC Output (27SEP84)	654 ma at 12.658 VDC
24 VDC Output (27SEP84)	153 ma at 25.60 VDC
PCU Power consumption	approx 1.2 watts

Regulator Panel

Input voltage	24 VDC
Output to oscillators	12 to 22 VDC adjustable

Transmitters

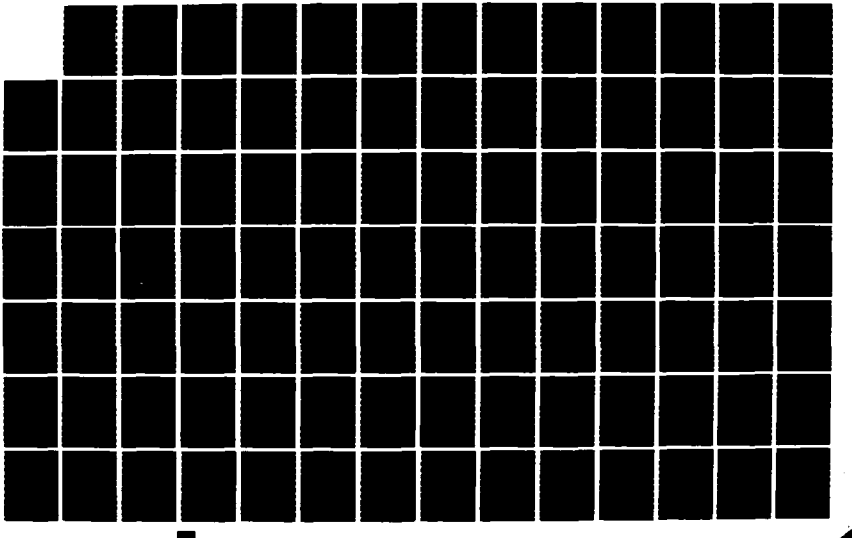
	Monitron 715 series
Frequency band	150-160 MHz
Input power	50-100 ma at [illegible]
RF output power	100-500 mwatts
Modulation (type 20F3)	[illegible]
Audio bandwidth	300-3000 [illegible]
Audio input	[illegible]
Input impedance	[illegible]
Frequency assignments	Antenna [illegible]
#0 152.165	[illegible]
#1 153.356	[illegible]
#2 159.565	[illegible]
#3 157.500	[illegible]
#5 155.000	[illegible]
#6 153.110	
#7 153.?60	

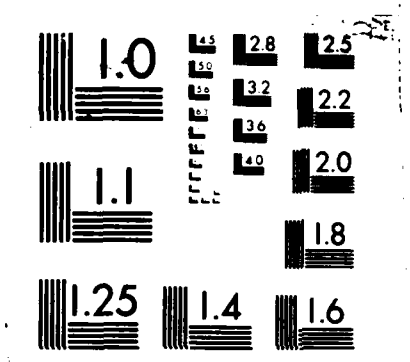
Antenna mounting scheme

#0 RTG [illegible]

#1 Ross [illegible]

#7 Nova





SYSTEM SPECIFICATIONS ON ROSS ISLAND

Receivers			Monitron R15 series
	Frequency band		150-160 MHz
	Input power		20-30 ma at 10-15 VDC
	Audio output		0 to +6 dBm (adjustable)
	Frequency response		300-3000 Hz
	Output impedance		600 Ohms
	Frequency assignments		Antenna frequency
	#0	152.165	152.165
	#1	153.356	154.565
	#2	159.565	159.565
	#3	157.500	157.500
	#5	155.000	156.000
	#6	153.110	153.110
	#7	153.960	153.960
	spare	150.935	150.965
	Antenna mounting scheme		<-- Crater Hill <--
	#5 Aurora	#0 RTG	#1 Erebus #7 Nova
	#6 Vee	spare	#3 Ross
		#2 Terror	
Discriminators			
	Audio bandwidth		1.1 to 1.7 kHz
	Audio deviation (10 dyne input)		+/- 10 Hz
	N-7 bandpass (channels 0,1,2,3)		7 to 70 second period
	N-6 bandpass (channels 4,5,6,7)		1 to 10 second period
	Filter/amplifier output		+/- 0.5 ma into 5.6 kOhms
	Analogue tape signal output		+/- 480 ua into 75 Ohms
	Analogue tape bias output		200 Hz at 1.5 ma
	Analogue tape timing current		4 ma into 75 Ohms
Chart recorders			
	N-7 Array		EA A601R rectilinear milliammeter
	Input impedance		5.6 kOhms
	Time marks		IRIG "D" slow code on each margin
	N-6 Array		Geotech 3-Channel Helicorder
	Input impedance		1.5 MOhms
Slow-speed Analogue Tape Recorder			Model N-2
	Track scheme		IRIG (1/2 of 14-track 1")
	Speed		1/4 inch per minute
	Head bias current		1.5 ma
	Peak head current		480 ua (10 dynes)
	Time mark scheme		10 sec ea 5 min, 20 sec on hour
Digital System			
	Minicomputer		DEC PDP-11/03
	A/D Converter		Data Translation DT1761
	Sampling rate		N-7: 1 Hz, N-6: 4 Hz
	Data storage		Digi-data 1740 tape drive
	Storage medium		10" reel magnetic tape
	Operator's console		Lear-Siegler ADM-3A
	Printer		IDS-440 Paper Tiger

Appendix B

COMPUTER SYSTEM CONFIGURATIONS

DATA ACQUISITION SYSTEM

DEC PDP 11/03-L Minicomputer s/n AG27606	
BA11-N mounting box with bezel front panel	
LTC controlled by front panel AUX switch	W1,W2 installed
RUN indicator controlled by CPU	W3 rem, W4 inst
CPU enabled	HALT up
LTC disabled	AUX down
H9273 backplane s/n AG4730216	
Line Time Clock enabled	W1 installed
First slot for quad-height CPU	W2, W3 installed
H786 power supply s/n 5469821	
KD11-H (M7270) LSI-11/2 processor s/n AG2474387	
Master Clock enabled	W1 installed
Event Line (LTC) disabled	W3 installed
Power-Up Mode 2 (PC at 173000 for bootstrap)	W5 inst, W6 rem
DT1761-DI-PG A/D Converter s/n 19242	
Device address: 177000	B8: 1,3,6,8 closed
	B11: 2,3 closed
Vector address: 130	B11: 4,5,6 closed
Differential inputs	P4 to P3 to P2
+/- 10 volt range	R5 to R1
Two's complement notation	R2 to R4, S2 to S1
D/A outputs disabled	X1 to X3, Y1 to Y3
Z Set up delay 3 usec	D to D1
Z Pulse width 0.5 usec	I to I2
MSV11-DD (M8044-DB) 32k by 16 MOS memory s/n MO9500673	
Bank 7 disabled	Pin 1 to Pin 3
Memory power from bus-powered backplane	W2, W3 installed
No parity operation	Pin 5 to Pin 7
16k Memory size	10 to 14, 15 to 16
Starting address: 000000	S1 all ON
DQ120 153002-RevB s/n 20075	
Tape speed 45ips	S1,S3 ON, S2,S4 OFF
DEC format (LSB written first)	S5 ON
DLV11-J (M8043) Quad Serial Line Unit s/n AB0330DZ53	
Base address: 176500	A5,A9 X to 0
	A7 rem, A6 inst
	others X to 1
Channel 3 base address: 177560	C1,C2 X to 1
Ch3 break causes halt	X to H
Base vector: 300	V6,V7 installed
	V5 X to 0
All channels: Odd parity	E X to 0
All channels: 8 data bits	D X to 1
All channels: 1 stop bit	S X to 0
All channels: Parity inhibited	P X to 1
Ch0, Ch1, Ch2 9600 baud	0,1,2 to N
Ch3 1200 baud	3 to W
All channels: RS-232C	M,N X to 3
All channels: slew rate of 2 usec	R10,R23 22k
TCU-50 Clock s/n 006421	
Device address: 160770	factory config
Normal Year (not a leap year)	C to A
Empty slot	
W941 4-Hz trigger (in right half of slot)	
BDV11-AA (M8012) Bootstrap/Diagnostic/Terminator s/n AB01301KT7	
Standard memory configuration (group A)	W2,W3,W9,W12 inst
	W1,W4,W10,W11 rem

ROM chips are 8316E with CS1,CS2,CS3 low	W5,W7 installed W6,W8,W13 removed
Execute CPU test on power-up or restart	E15-A1 ON
Execute memory test on power-up or restart	E15-A2 ON
No DECNET boot	E15-A3 OFF
Console test and dialogue	E15-A4 ON
DY0: boot	E15-A5,A8 OFF E15-A6,A7 ON E21-B1 OFF
No ROM Boot	E21-B2,B3,B4 OFF
LTC function is program controlled	E21-B5 ON

Digi-Data 1749-8-4-110-UL Tape Transport s/n 01881

Tape Unit 0	W8,W10 installed
Transport status gated by ARM I/O	W12 installed
WRITE MODE remains true unless SWS unused	W13 installed
EOT remains true after passing marker	W18 installed
Single density NRZ only unit	W19 installed
On-line control from front panel	W30 installed
45ips tape speed	S3-1,2 CLOSED S3-3,4,5,6 OPEN
9 track, 800 bpi, NRZ format	S1-2,3,6 CLOSED S1-1,4,5,7 OPEN W3, W24 installed
High Density lamp indicates EOT	W23 installed
On Line lamp indicates ON LINE	W27 installed
+5vDC test card supply disabled	W4 removed
Operate transport	S2 in center pos.

Lear Siegler ADM-3A Video Terminal s/n 43225

Baud rate: 1200	S1-6 ON
Full Duplex	S2-5 OFF
RS-232C communication	S2-6 ON
Auto NL after 80th character	S2-7 ON
Lower Case characteres enabled	S3-1 ON
Odd parity	S3-2 ON
8 data bits	S3-3 OFF
1 stop bit	S3-4 ON
Parity inhibited	S3-5 OFF
Bit 8 equals 0	S3-6 ON
24 line display	S4-1 OFF
60Hz refresh rate	S4-2 OFF
Remote (CTRL-Z) clear screen enabled	S4-3 OFF
Keyboard Lock enabled	S4-4 OFF
Upper/Lower Case display	S4-5 OFF
Destructive cursor	S4-6 ON
Local (direct to computer) mode	S5-1,2,3,4,5 OFF S5-6 ON
Block Cursor with cursor control	S5-7 ON
Normal operation	S6 OFF

Integral Data Systems IDS-440G Paper Tiger Printer s/n12575

Page length: 11 inches	S3-1,3 ON, S3-2 OFF
Baud rate: 1200	S3-4,5 ON
Control codes disabled	S3-6 OFF
Serial EIA interface	S3-7 ON
12 characters per inch	S4-1 OFF, S4-2 ON
8 lines per inch	S4-3 ON
Page skip over perforation disabled	S4-4 OFF
Auto LF on receipt of CR disabled	S4-5 OFF
Remote control deselect disabled	S4-6 OFF
60 Hz power supply	S4-7 OFF

OFFLINE ANALYSIS SYSTEM

DEC PDP 11/03-L Minicomputer s/n AG21256	
BA11-N mounting box with bezel front panel	
LTC controlled by front panel AUX switch	W1,W2 installed
RUN indicator controlled by CPU	W3 rem, W4 inst
CPU enabled	HALT up
LTC enabled	AUX up
H9273 backplane s/n AG2970643	
Line Time Clock enabled	W1 installed
First slot for quad-height CPU	W2, W3 installed
H786 power supply s/n 7941064	
KD11-H (M7270) LSI-11/2 processor s/n AB00156981	
Master Clock enabled	W1 installed
Event Line (LTC) enabled	W3 removed
Power-Up Mode 2 (PC at 173000 for bootstrap)	W5 inst, W6 rem
MSV11-DD (M8044-DB) 32k by 16 MOS memory s/n MO9500673	
Bank 7 disabled	Pin 1 to Pin 3
Memory power from bus-powered backplane	W2, W3 installed
No parity operation	Pin 5 to Pin 7
16k Memory size	10 to 14, 15 to 16
Starting address: 000000	S1 all ON
DSD4432 A4432-4-RevA DSD440 Controller s/n 304-2	
Device address: 177170	Pos 1,2 closed
Boot PROM address: 171000	Pos 3 open
	Pos 4 closed
Vector address: 264	IV3,IV6,IV8 shorted
	IV2,IV4,IV5,IV7 open
Boot enabled	DBST open
RX02 (double density) emulation	J12 open
DSD4140 804140-01-RevE DSD430 Controller s/n 1928	
Device address: 177150, Vector address: 270	DV closed
Boot disabled	B1,B2 closed
Single-sided drives	B50 open
Drive 0 is 0 and Drive 1 is 1	RM open
Single level interrupt system	HINT open
Operation enabled	J12 closed
DQ120 153002-RevB s/n 20072	
Tape speed 45ips	S1,S3 ON, S2,S4 OFF
DEC format (LSB written first)	S5 ON
DLV11-J (M8043) Quad Serial Line Unit s/n AB01604VL4	
Base address: 176500	A5,A9 X to 0
	A7 rem, A6 inst
	others X to 1
Channel 3 base address: 177560	C1,C2 X to 1
Ch3 break causes halt	X to H
Base vector: 300	V6,V7 installed
	V5 X to 0
All channels: Odd parity	E X to 0
All channels: 8 data bits	D X to 1
All channels: 1 stop bit	S X to 0
All channels: Parity inhibited	P X to 1
Ch0 600 baud	0 to V
Ch1 300 baud	1 to T
Ch2 600 baud	2 to V
Ch3 4800 baud	3 to L
All channels: RS-232C	M,N X to 3
All channels: slew rate of 2 usec	R10,R23 22k
D1000 CP/M emulator s/n 161	
Device address: 177160	factory config
TCU-50 Clock s/n 005547	

Device address: 160770	factory config
Normal Year (not a leap year)	C to A
BDV11-AA (M8012) Bootstrap/Diagnostic/Terminator s/n AB01301KT7	
Standard memory configuration (group A)	W2,W3,W9,W12 inst
	W1,W4,W10,W11 rem
ROM chips are 8316E with CS1,CS2,CS3 low	W5,W7 installed
	W6,W8,W13 removed
Execute CPU test on power-up or restart	E15-A1 ON
Execute memory test on power-up or restart	E15-A2 ON
No DECNET boot	E15-A3 OFF
Console test and dialogue	E15-A4 ON
DY0: boot	E15-A5,A8 OFF
	E15-A6,A7 ON
	E21-B1 OFF
No ROM Boot	E21-B2,B3,B4 OFF
LTC function enabled	E21-B5 OFF
Data Systems Design DSD440 Disk Drive s/n 44-4053	
Drive A: SA800-2 s/n G14475	
Configured by DSD as follows:	
Jumpers installed: 800,A,B,C,D,DC,DS,DS1,L,T2,Y	
Jumpers removed: 801,DS2,DS3,DS4,HL,T1,T3,T4,T5,T6,X,Z	
Drive B: SA800-2 s/n E14356	
Configured by DSD as follows:	
Jumpers installed: 800,A,B,C,DC,DS,DS2,L,T1,T2,T3,T4,T5,T6,Y	
Jumpers removed: 801,D,DS1,DS3,DS4,HL,X,Z	
Wire wrap jumper from D pin to I/O pin 8	
Microcomputer Power Inc. model CP-146 power supply	
Data Systems Design DSD430 Disk Drive s/n 43-545	
Drive A: SA801 s/n GB7784	
Configured by DSD as follows:	
Jumpers installed: 800,A,B,C,D,DS,DS1,T2,Y	
Jumpers removed: 801,DC,DS2,DS3,DS4,HL,T1,T3,T4,T5,T6,X,Z	
Drive B: SA801 s/n GB7497	
Configured by DSD as follows:	
Jumpers installed: 800,A,B,C,DS,DS2,T1,T2,T3,T4,T5,T6,Y	
Jumpers removed: 801,D,DC,DS1,DS3,DS4,HL,X,Z	
Wire wrap jumper from D pin to I/O pin 12	
Xentek model 33 rev B XPD60-6118 power supply s/n 1060	
Digi-Data 1749-8-4-110-UL Tape Transport s/n 01796	
Tape Unit 0	W8,W10 installed
Transport status gated by ARM I/O	W12 installed
WRITE MODE remains true unless SWS unused	W13 installed
EOT remains true after passing marker	W18 installed
Single density NRZ only unit	W19 installed
On-line control from front panel	W30 installed
45ips tape speed	S3-1,2 CLOSED
	S3-3,4,5,6 OPEN
9 track, 800 bpi, NRZ format	S1-2,3,6 CLOSED
	S1-1,4,5,7 OPEN
	W3, W24 installed
High Density lamp indicates EOT	W23 installed
On Line lamp indicates ON LINE	W27 installed
+5vDC test card supply disabled	W4 removed
Operate transport	S2 in center pos.
Epson RX-80 Printer s/n 374644	
Printer configuration	
Pica-sized characters on power-up	S1-1 OFF
Graphic symbols disabled	S1-2 OFF
Buzzer enabled	S1-3 OFF
Page length: 11 inches	S1-4 OFF

Paper sensor enabled	S1-5 OFF
USA character set	S1-6,7,8 ON
Zero font with slash	S2-1 ON
Remote control disabled	S2-2 ON
Auto LF after CR disabled	S2-3 OFF
Skip over perforation disabled	S2-4 OFF
Serial Interface (8148) configuration	
8 data bits	S1-1 OFF
Parity inhibited	S1-2 OFF
Odd parity	S1-3 OFF
Positive flag polarity	S1-4 OFF
Baud rate: 300	S1-5,7 ON, 6,8 OFF
Serial interface enabled	S2-1 ON
2k buffer enabled	S2-2 ON
Flag reset when only 152 characters left	S2-3,4 OFF
Self-test disabled	S2-5,6 OFF
Control signal conditioning	J5 installed
	J1,J2,J3,J4,J6 rem
2k-byte RAM	J7B installed
X-on/X-off enabled	J8A,J8B installed
CPU is uPD7811	J9A installed
	J9B removed
RS-232C mode	JRS, JF installed
	JCL,JX removed
Addmaster 510 Paper Tape Reader/Punch s/n 0021	
Remote control disabled	DSW1-1,2 OPEN
8 data bits	DSW1-3,4 OPEN
Parity inhibited	DSW1-5 CLOS, 6 OPEN
1 stop bit	DSW1-7 OPEN, 8 CLOS
Reader: 5 level tape	DSW2-1,2 ON
Baud rate: 600	DSW2-3,4 OFF, 5 ON
Transmit/Receive data in ASCII	DSW2-6 ON
Punch data in BAUDOT	DSW2-7 OFF
Reader data in BAUDOT	DSW2-8 OFF
Punch: 5 level tape	DSW2-9,10 ON
RS-232C interface, non-inverted, internal clk	DAP1-5 as on p.15
Factory selected keyboard interface polarities	DAP8 as on p.18
Lear Siegler ADM-3A Video Terminal s/n 83499	
Baud rate: 4800	S2-2 ON
Full Duplex	S2-5 OFF
RS-232C communication	S2-6 ON
Auto NL after 80th character	S2-7 ON
Lower Case characteres enabled	S3-1 ON
Odd parity	S3-2 ON
8 data bits	S3-3 OFF
1 stop bit	S3-4 ON
Parity inhibited	S3-5 OFF
Bit 8 equals 0	S3-6 ON
24 line display	S4-1 OFF
60Hz refresh rate	S4-2 OFF
Remote (CTRL-Z) clear screen enabled	S4-3 OFF
Keyboard Lock enabled	S4-4 OFF
Upper/Lower Case display	S4-5 OFF
Destructive cursor	S4-6 ON
Local (direct to computer) mode	S5-1,2,3,4,5 OFF
	S5-6 ON
Block Cursor with cursor control	S5-7 ON
Normal operation	S6 OFF
RG-512 Retro-Graphics card s/n 7821	

No trailer codes	S1,S2 OFF
Auto NL enabled	S3 ON
1 stop bit	S4 ON
Bit 8 equals 0	S5 ON
Parity inhibited	S6 OFF
8 data bits	S7 OFF
Odd parity	S8 ON
GP-100 interface card	
Handshaking disabled	S1,S2 OPEN

```
RT-11 SYSTEM 84
DIRECTORY
    SWAP   .SYS     24 25-Aug-78       DYMNSJ.SYS     60 11-Jan-84
    TT     .SYS      2 11-Jan-84       LP     .SYS     2 12-Jan-84
    PC     .SYS      2 20-Jan-84       DY     .SYS     3 11-Jan-84
    NL     .SYS      2 11-Jan-84       MT     .SYS     8 11-Jan-84
    DUP    .SAV     21 25-Aug-78       DIR    .SAV    17 25-Aug-78
    EDIT   .SAV     19 25-Aug-78       LINK   .SAV    29 25-Aug-78
    PIP    .SAV     16 25-Aug-78       CP     .SAV    73 16-Jun-83
    SYSMAC.SML      37 25-Aug-78       SYSLIB.OBJ    195 11-Jan-84
    MACRO  .SAV     45 25-Aug-78       FORTRA.SAV    175 25-Aug-78
    RESORC.SAV      12 25-Aug-78       FORMAT.SAV      6 25-Aug-78
    CREF   .SAV      6 25-Aug-78       SRCCOM.SAV     11 25-Aug-78
    DUMP   .SAV      7 25-Aug-78       ODT    .OBJ     9 25-Aug-78
    LIBR   .SAV     18 25-Aug-78       PATCH  .SAV     9 25-Aug-78
    MBOOT  .BOT      1 25-Aug-78       MBOOTP.PRI      2 02-Sep-80
    MBOOTS.SEC       2 27-Sep-80       HELP   .TEC     3 25-Aug-78
    TECO   .SAV     27 25-Aug-78       LOCAL  .TEC     2 25-Aug-78
    SORT   .TEC      3 25-Aug-78       CLEAR  .SAV     2 07-Apr-84
    REWIND.SAV       2 07-Apr-84       LPINIT.SAV      2 07-Apr-84
    CPM    .INI      1 27-Mar-84       BASIC  .SAV     52 05-Mar-84
    LP16   .SAV      2 28-May-84       SETDAT.SAV      2 12-Sep-84
    SETTCU.SAV       2 12-Sep-84       STARTS.COM      1 12-Sep-84
    PASCAL.SAV      52 26-Jun-78       < UNUSED >      8
     43 Files, 966 Blocks
     8 Free blocks

STARTS.COM
    ASSIGN DY0: DK:
    ASSIGN MT0: 2
    ASSIGN TT: 5
    ASSIGN TT: 7
    ASSIGN LP: 6
    SET TT: SCOPE
    SET USR NOSWAP
    SET LP: CTRL
    SET LP: NOFORM0
    SET LP: LC
    R LPINIT
    R SETDAT
    DATE
    TIME

CPM.INI
    A: DY2:
    B: DY3:
    C: DY1:
    LST: DY1:CRAYON.LST
    GO
```

RT-11 SYSTEM FOR CP/M

```
DIRECTORY
    SWAP   .SYS     24 25-Aug-78      DYMNSJ.SYS     60 11-Jan-84
    TT     .SYS      2 11-Jan-84      LP     .SYS     2 12-Jan-84
    PC     .SYS      2 20-Jan-84      DY     .SYS     3 11-Jan-84
    NL     .SYS      2 11-Jan-84      MT     .SYS     8 11-Jan-84
    DUP    .SAV     21 25-Aug-78      DIR    .SAV    17 25-Aug-78
    PIP    .SAV     16 25-Aug-78      CP     .SAV    73 16-Jun-83
    CLEAR  .SAV      2 07-Apr-84      LPINIT.SAV      2 07-Apr-84
    LP16   .SAV      2 28-May-84      SETDAT.SAV      2 12-Sep-84
    SETTCU.SAV       2 12-Sep-84      STARTS.COM      1 04-Oct-84
    CPM    .INI      1 08-Oct-84      < UNUSED >    732
     19 Files, 242 Blocks
     732 Free blocks

STARTS.COM
    ASSIGN DY0: DK:
    ASSIGN MT0: 2
    ASSIGN TT: 5
    ASSIGN TT: 7
    ASSIGN LP: 6
    SET TT: SCOPE
    SET USR NOSWAP
    SET LP: CTRL
    SET LP: NOFORM0
    SET LP: LC
    R LPINIT
    R SETDAT
    DATE
    TIME
    R CP

CPM.INI
    A: DY1:
    B: DY2:
    LST: DY0:CRAYON.LST
    SEN: LP:
    GO
```

SYSTEM FOR INTRO TO RT-11

```
DIRECTORY
    SWAP  .SYS    24 25-Aug-78       DYMNSJ.SYS    60 11-Jan-84
    TT    .SYS     2 11-Jan-84       LP    .SYS     2 12-Jan-84
    PC    .SYS     2 20-Jan-84       DY    .SYS     3 11-Jan-84
    NL    .SYS     2 11-Jan-84       MT    .SYS     8 11-Jan-84
    DUP   .SAV    21 25-Aug-78       DIR   .SAV    17 25-Aug-78
    EDIT  .SAV    19 25-Aug-78       LINK  .SAV    29 25-Aug-78
    PIP   .SAV    16 25-Aug-84       MACRO .SAV    45 25-Aug-84
    FORTRA.SAV   175 25-Aug-84       RESORC.SAV    12 25-Aug-84
    SRCCOM.SAV    11 25-Aug-84       LIBR  .SAV    18 25-Aug-84
    LPINIT.SAV     2 07-Apr-84       HELP  .SAV    21 25-Aug-84
    HELP  .TXT    74 25-Aug-84       HELP  .TEC     3 25-Aug-84
    STARTS.COM     1 08-Oct-84       DEMOF1.FOR     2 25-Aug-84
    DEMOX1.MAC     3 25-Aug-84       DEMOED.TXT     1 25-Aug-84
    DEMOSP.MAC    10 25-Aug-84       ODT   .OBJ     9 25-Aug-84
    SYSLIB.OBJ   202 28-Oct-82       SYSMAC.SML    37 25-Aug-84
    BASIC .SAV    52 05-Mar-84       CREF  .SAV     6 25-Aug-84
    SETDAT.SAV     2 12-Sep-84       < UNUSED >    83
     33 Files, 891 Blocks
     83 Free blocks

STARTS.COM
    ASSIGN DY0: DK:
    ASSIGN MT0: 2
    ASSIGN TT: 5
    ASSIGN TT: 7
    ASSIGN LP: 6
    SET TT: SCOPE
    SET USR NOSWAP
    SET LP: CTRL
    SET LP: NOFORM0
    SET LP: LC
    R LPINIT
    R SETDAT
    DATE
    TIME
```

CP/M WORKING DISK DIRECTORIES

MINCE & SCRIBBLE

```
    ALPH    .COM   6k : CAT     .COM   2k : CONFIG  .DAT   8k : CRAYON  .COM  24k
    GENSYS  .COM   1k : INITFL  .COM   1k : MINCE   .COM  31k : MINCE   .SWP  97k
    OTHELLO .COM  12k : PIP     .COM   8k : REC     .COM   1k : SCRIBBLE.COM  27k
    SCRIBBLE.OVL  11k : SEN     .COM   1k
    Total of 230k in 14 files with 11k space remaining.
```

SCRIBBLE DISK

```
    CAT     .COM   2k : CONFIG  .DAT   9k : CRAYON  .COM  24k : PIP     .COM   8k
    SCRIBBLE.COM  27k : SCRIBBLE.OVL  11k
    Total of 80k in 6 files with 161k space remaining.
```

CP/M SYSTEM WITH PALANTIR

```
    ASM     .COM   8k : CAT     .COM   2k : DDT     .COM   5k : DUMP    .COM   1k
    ED      .COM   7k : GENSYS  .COM   1k : HELP    .WPH  23k : INITFL  .COM   1k
    LOAD    .COM   2k : MOVCPM  .COM  10k : PIP     .COM   8k : REC     .COM   1k
    SEN     .COM   1k : STAT    .COM   6k : SUBMIT  .COM   2k : UNLOAD  .COM   1k
    WP      .COM   9k : WPEDCOPY.WPO   4k : WPEDCOM .WPO   4k : WPEDFCD .WPO   2k
    WPEDFD  .WPO   2k : WPEDFI  .WPO   1k : WPEDFILE.WPO   4k : WPEDFIND.WPO   7k
    WPEDFORM.WPO   6k : WPEDHELP.WPO   2k : WPEDINIT.WPO   5k : WPEDIT  .WPO   9k
    WPEDIT2 .WPO  15k : WPEDPAGE.WPO   3k : WPEDPRN2.WPO  20k : WPEDPRNT.WPO   4k
    WPEDSVRD.WPO   3k : WPEDTYPE.WPO   1k : WPEFL   .WPO   3k : XSUB    .COM   1k
    Total of 180k in 36 files with 61k space remaining.
```

BDS C WORKING DISK

```
    BDS     .LIB   6k : BDSCIO  .H     5k : C       .CCC   2k : CC2     .COM  16k
    CLIB    .COM   6k : COMPILE .COM  14k : DEFF    .CRL   9k : DEFF2   .CRL   6k
    LINK    .COM   5k : WILDEXP .CRL   3k : WILDEXP .DOC   2k
    Total of 74k in 11 files with 167k space remaining.
```

FORTH WORKING DISK

```
    FORTH   .COM  24k : FORTH   .SCR  87k : EDITOR  .SCR  63k : SCOPY   .SCR  21k
    UPDATE  .DOC  13k
    Total of 208k in 5 files with 33k space remaining.
```

Appendix C

EQUIPMENT INVENTORY

EQUIPMENT INVENTORY

This is a listing of all of the Geophysical Institute equipment located at the McMurdo Station Infrasonics Lab, or at the Windless Bight Infrasonic Observatory. An asterisk indicates that no number exists.

GI no.	Model number	Serial No.	Manufacturer	Description
016912	11/03-LH	AG21256	Digital	BA11-N computer mainframe
013280	11/03-LK	AG27606	Digital	BA11-N computer mainframe
*	M7270	AB00156981	Digital	KD11-HA processor board
*	M7270	2474387	Digital	KD11-HA processor board
*	M7270	1950169	Digital	KD11-HA processor board
*	M8044-DB	M09500673	Digital	MSV11-D 32K MOS memory br
*	M8044-DB	M09351111	Digital	MSV11-D 32K MOS memory br
*	M8044-DB	M09501893	Digital	MSV11-D 32K MOS memory br
*	M8043	AB01604VL4	Digital	DLV11-J serial interface
*	M8043	AB92129892	Digital	DLV11-J serial interface
*	M8043	AB0330DZ53	Digital	DLV11-J serial interface
*	M8012	AB92654806	Digital	BDV11 bootstrap board
*	M8012	1956191	Digital	BDV11 bootstrap board
*	M8012	AB01301KT7	Digital	BDV11 bootstrap board
*	W941	*	Digital/GI	4Hz A/D trigger board
*	W941	*	Digital/GI	4Hz A/D trigger board
*	M7940	AB1090T0C4	Digital	DLV11 serial interface br
*	W987	*	Digital	Quad extender board
*	DT1761-DI-PG	19242	Data Translation	A/D converter board
*	DT1761-DI-PG	19240	Data Translation	A/D converter board
*	DT1761-DI-PG	21461	Data Translation	A/D converter board
*	DQ120	20072	Dilog	Tape controller board
*	DQ120	20075	Dilog	Tape controller board
*	TCU-50	005547	Digital Pathways	Real-time clock board
*	TCU-50	006421	Digital Pathways	Real-time clock board
*	A4432-4	3042	Data Sys. Design	DSD440 disk controller br
*	804140-01	1928	Data Sys. Design	DSD430 disk controller br
*	D100Q	161	Decmation	Z-80 processor board
016916	ADM-3A	579498	Lear Siegler	Computer terminal
7472	ADM-3A	43225	Lear Siegler	Computer terminal
7666	ADM-3A	83499	Lear Siegler	Computer terminal
013884	P80RA	337459	Epson	RX-80 printer
016915	P80RA	374644	Epson	RX-80 printer
13102	440G	12575	Integral Data Sys	Printer
7766	440G	11174	Integral Data Sys	Printer
*	440G	9332	Integral Data Sys	Printer (unusable)
016909	GP100/912	3661	Dig. Engr/Comprint	Graphics printer
013308	1749-8-4-110-UL	01796	Digi-Data	Tape transport
013612	1749-8-4-110-UL	02879	Digi-Data	Tape transport
013328	1749-8-4-110-UL	01881	Digi-Data	Tape transport
013601	DSD430	43-545	Data Sys. Design	Disk drive
13075	DSD440	44-4053	Data Sys. Design	Disk drive
016911	510	510021	Addmaster	Reader/punch
145	UPS-252-1	538	Elgar	Uninterruptible power su
017071	UPS-252-1	661	Elgar	Uninterruptible power su

GI no.	Model number	Serial no.	Manufacturer	Description
NS-7300	A601-R	167811	Esterline Angus	Chart recorder
NS-7304	A601-R	167815	Esterline Angus	Chart recorder
NS-7305	A601-R	167816	Esterline Angus	Chart recorder
NS-7306	A601-R	167817	Esterline Angus	Chart recorder
NS-7307	A601-R	167818	Esterline Angus	Chart recorder
12907	RV-301B	482	Teledyne/Geotech	Helicorder
12907A	AR-320	205	Teledyne/Geotech	Helicorder amplifier
013336	9100	1793	Datum	Time code generator
AF-9494	8210	200	Systron Donner	Digital clock
AF-9495	8210	856	Systron Donner	Digital clock
*	CS15-0.4	1223	Valor	Power supply
017201	N-6	WBA	Geophys. Inst.	Discriminator card cage
017202	N-7	SCB	Geophys. Inst.	Discriminator card cage
017203	N-2	*	Geophys. Inst.	Slow-speed tape drive
*	B-350	22176	AMCO	Blower
*	B-350	35904	AMCO	Blower
016913	*	222698	AMCO	Equipment rack
017204	*	152615	AMCO	Equipment rack
*	*	*	(unknown)	Equipment rack (gray)
*	*	*	(unknown)	Equipment rack (blue & wh
016914	*	*	Smith Systems	Magnetic tape rack
*	51FEB112 101	P201341	Carrier	Air conditioner
*	4024	*	West Bend	Humidifier
*	4024	*	West Bend	Humidifer
016910	APMB	2119	SIMCO	Portable static eliminat
*	*	*	Geophys. Inst.	Light table
*	00327	*	Nat'l Geographic	16" physical globe
13079	JTK-17	*	Jensen tools	Tool kit
13010	214	B108893	Tektronix	Storage oscilloscope
013805	310	*	Triplett	Multimeter
017205	8020A	2680758	Fluke	Digital multimeter
013804	8060A	3205704	Fluke	Digital multimeter
11273	II	*	Logic Technology	Pocket freq. counter
*	456	*	Skil	1/4" electric drill
016917	173RTN-1190A	JH260M	Motorola	Micro 2-way FM radio
016918	173RTN-1190A	JH262M	Motorola	Micor 2-way FM radio
016919	173RTN-1190A	JH263M	Motorola	Micro 2-way FM radio
GR17526	T15P23	098	Monitron	150.935 MHz transmitter
GR17533	R15F	098	Monitron	190.935 MHz receiver
GR17524	T15P23	099	Monitron	152.165 MHz transmitter
GR17535	R15F	099	Monitron	152.165 MHz receiver
GR17525	T15P23	100	Monitron	154.565 MHz transmitter
GR17534	R15F	100	Monitron	154.565 MHz receiver
11186	T15F23	121	Monitron	153.356 MHz transmitter
11185	R15F	121	Monitron	153356 MHz receiver
11969	T15F23	147	Monitron	157.500 MHz transmitter
11968	R15F	147	Monitron	157.500 MHz receiver
017069	T15F20	492	Monitron	153.110 MHz transmitter
017070	R15F	492	Monitron	153.110 MHz receiver
13082	T15F20	621	Monitron	155.000 MHz transmitter
13083	R15F	621	Monitron	155.000 MHz receiver
013353	T15F20	705	Monitron	159.565 MHz transmitter
013354	R15F	705	Monitron	159.565 MHz receiver
013606	TR150	808	Monitron	153.960 MHz transmitter
013605	R15F	808	Monitron	153.960 MHz receiver
13060	PCU-001-50004	SC1014	Teledyne/Isotopes	Sentinel power condition

5 large infrasonic sensors
3 small infrasonic sensors
4 spare oscillators for infrasonic sensors
2 spare microphone capsules for infrasonic sensors
4 spare N-7 discriminator cards
3 spare N-6 discriminator cards

Appendix D

DOCUMENTATION DIRECTORY

INFRASONICS
VOLUME 1
OWNER'S MANUAL

INFRASONICS
VOLUME 2
SOFTWARE

I. DATA RETRIEVAL PROGRAMS

II. OFFLINE ANALYSIS PROGRAMS

III. DATA ACQUISITION ENSEMBLE: RT68CH

IV. UTILITY PROGRAMS

V. RIOMETER UTILITY PROGRAMS

VI. UTILITY ASSEMBLY LANGUAGE SUBROUTINES

VII. DATA ACQUISITION AND RETRIEVAL FORTRAN SUBROUTINES

VIII. OFFLINE ANALYSIS FORTRAN SUBROUTINES

INFRASONICS
VOLUME 3
PAPERS

I. SUPPLEMENTAL BUDGET: ANTARCTIC ATMOSPHERIC INFRASOUND, APRIL 1977

II. RESEARCH PROPOSAL: ANTARCTIC ATMOSPHERIC INFRASOUND, JUNE 1977

III. PAPERS ON INFRASONICS BY DR. CHARLES R. WILSON
- Evidence of Two Sound Channels in the Polar Atmosphere from Infrasonic Observations of the Eruption of an Alaskan Volcano
- Infrasonic Pressure Waves from the Aurora: a Shock Wave Model
- Infrasonic Waves from Moving Auroral Electrojets
- Auroral Infrasonic and Ionospheric Absorption Substorms
- Infrasonic Waves from Alaskan Volcanic Eruptions
- Auroral Infrasonic Waves and Poleward Expansions of Auroral Substorms at Inuvik, N.W.T., Canada
- Auroral Infrasonic Wave-Generation Mechanism
- Auroral Infrasonic Wave Generation Mechanism
- Seasonal Variation of Auroral Infrasonic Wave Activity
- The Motions of Peaks in Ionospheric Auroral Absorption and Auroral Infrasonic Waves
- Infrasonic Wave Generation by Aurora
- Auroral Infrasonic Waves Observed at Windless Bight, Antarctica

IV. PAPERS ON INFRASONICS BY OTHER SCIENTISTS
- Variation of Nuclear Explosion Generated Acoustic-Gravity Wave Forms with Burst Height and with Energy Yield
- An Infrasonic Pressure Disturbance Study of Two Polar Substorms
- Auroral Audibility
- The D-C Pressure Summator: Theoretical Operation, Experimental Tests and Possible Practical Uses
- Infrasound Originating Near Mountainous Regions in Colorado
- Case Study Using Arrays of Infrasonic Microphones to Detect and Locate Meteors and Meteorites

V. PAPERS ON DATA ANALYSIS TECHNIQUES
- Data-Adaptive Polarization Filters for Multichannel Geophysical Data
- Lecture Notes on Polarization Filters
- Detection and Filtering Signals from Scalar Arrays Using the State Detector Approach

VI. EXAMPLES OF INFRASONIC SIGNALS
- Auroral Infrasonic Waves
- Eruption of Mt. Augustine Volcano
- Chinese Atmospheric Nuclear Test
- Microbaroms
- Surface Seismic Waves
- Mountain Associated Infrasound

INFRASONICS
ADDITIONAL BOOKS
MANUALS

I. HARDWARE MANUALS AND BOOKS
- DEC Microcomputer Processor Handbook
- DEC Microcomputer Interfaces Handbook
- DEC Memories and Peripherals
- TTL Cookbook
- Data Acquisition and Conversion Handbook
- Code of Federal Regulations, Title 10: Energy
- Linear IC Applications Notes, Volume 1
- Linear IC Applications Notes, Volume 2
- ARRL Antenna Book
- Assorted Device Data Books

II. SOFTWARE MANUALS AND BOOKS
- RT-11 Volume 1: Installation Manuals
  - Documentation Directory
  - System Release Notes
  - DECTAPE Installation Notes
  - PDT-11 Installation Notes
  - System Generation Manual
  - Intro To RT-11
- RT-11 Volume 2: Computer Manuals
  - System User's Guide
  - TECO User's Guide
  - System Message Manual
- RT-11 Volume 3: Desk Manuals
  - Advanced Programmer's Guide
  - MACRO Language Reference Manual
- RT-11 Volume 4: FORTRAN Manuals
  - Installation Guide
  - User's Guide
  - Language Reference Manual
- RT-11 Volume 5: BASIC and PASCAL Manuals
  - BASIC Installation Guide
  - BASIC User's Guide
  - BASIC Language Reference Manual
  - PASCAL User Manual
  - PASCAL Intro to Programming
- RT-11 Volume 6: FORTRAN Scientific Subroutine Package
- FORTRAN For Humans
- Introduction to BASIC
- A Practical Introduction to PASCAL
- CP/M Volume 1: User Manuals
  - D100Q Installation and Operation Manual
  - 8086 FORTH User's Manual
- CP/M Volume 2: Word Processing Manuals
  - MINCE Screen Editor Manuals
  - SCRIBBLE Text Formatter Manuals
  - BDS C Compiler Manuals
  - PALANTIR Word Processor Installation and Operation
- The CP/M Handbook
- Discover FORTH
- The C Programming Language
- The Fast Fourier Transform
- Theory and Application of Digital Signal Processing

INFRASONICS
ADDITIONAL BOOKS
REPORTS

I. GIR PROGRESS REPORTS
- GIR 80-3 Digital Acquisition and Analysis System for Antarctica
- GIR 81-2 Digital Infrasonic System Installation in Antarctica
- GIR 81-4 Antarctic Atmospheric Infrasound
- GIR 82-1 Antarctic Digital Infrasonic System Upgrade
- GIR 82-3 Antarctic Microbarom Study
- GIR 83-1 Antarctic Infrasonic System Software
- GIR 83-2 Report on Search for an Infrasonic Signal at Windless Bight, Antarctica from May 11, 1983 Event at 14S, 1.5W
- GIR 83-3 Antarctic Atmospheric Observations
- GIR 84-1 Estimation of the Energy of Atmospheric Explosions Using the Infrasonic Array at Windless Bight, Antarctica

II. OTHER INFRASONIC REPORTS
- A Digital Data Acquisition and Analysis System for Infrasonic Waves in Antarctica (Master's Thesis by B. David Spell)
- Research on Linear and Nonlinear Atmospheric Waves
- Solitary Waves: A Hazard to Aircraft Operating at Low Altitudes
- Infrasonics Analysis Software by Dr. John Olson

III. UNIVERSITY OF ALASKA REPORTS
- Geophysical Institute Annual Report 1979-1980
- University of Alaska-Fairbanks 1981-1983 Catalog
- University of Alaska-Fairbanks 1982-1983 Research Annual Report

EQUIPMENT
VOLUME 1
DEC FIELD PRINTS

I. PDP11/03-L FIELD MAINTENANCE PRINT SET
1. Unit Assembly 11/03-L
2. Unit Assembly 11/03-L Parts List
3. Field Instructions & Acceptance
4. Shipping List
5. EIS/FIS Microm Parts List

II. BA11-N FIELD MAINTENANCE PRINT SET
1. Drawing Directory
2. Unit Assembly
3. Unit Assembly Parts List
4. Harness AC Power
5. Harness DC
6. Logic Assembly Drawing Directory
7. Logic Assembly Unit Assembly
8. Backplane Drawing Directory
9. Backplane Unit Assembly
10. Backplane Circuit Schematic
11. AC Input Box Drawing Directory
12. AC Input Box Unit Assembly
13. Switch Voltage Select Assembly
14. Bezel Assembly
15. Front Panel Drawing Directory
16. Front Panel Unit Assembly
17. Front Panel Parts List
18. Front Panel Circuit Schematic
19. Cable Console/Backplane
20. Door Assembly
21. Power Supply Drawing Directory
22. Power Supply Unit Assembly
23. Master Board Drawing Directory
24. Master Board Unit Assembly
25. Master Board Parts List
26. Master Board Circuit Schematic
27. Control Board Drawing Directory
28. Control Board Unit Assembly
29. Control Board Parts List
30. Control Board Circuit Schematic
31. Power Monitor Drawing Directory
32. Power Monitor Unit Assembly
33. Power Monitor Parts List
34. Power Monitor Circuit Schematic

III. BDV11-AA FIELD MAINTENANCE PRINT SET
1. Unit Assembly (BDV11-A)
2. Unit Assembly (M8012)
3. Parts List (M8012)
4. Circuit Schematic (M8012)
5. Engineering Specifications (M8012)
6. Shipping List (BDV11-A)

IV. DLV11-J FIELD MAINTENANCE PRINT SET

1. Parts List
2. Shipping List
3. Circuit Schematic
4. Unit Assembly
5. ROM Map

V. KD11-HA FIELD MAINTENANCE PRINT SET

1. Parts List
2. Unit Assembly
3. Circuit Schematic

VI. MSV11-D FIELD MAINTENANCE PRINT SET

1. Drawing Directory (MSV11-D)
2. Parts List (MSV11-D)
3. MSV11-D/E Block Diagram (MSV11-D)
4. MSV11-D/E Flow Diagram (MSV11-D)
5. MSV11-D/E Timing Diagram (MSV11-D)
6. Drawing Directory (M8044)
7. Parts List (M8044)
8. Unit Assembly (M8044)
9. Circuit Schematic (M8044)

EQUIPMENT
VOLUME 2
DEC DIAGNOSTICS

EQUIPMENT
VOLUME 3
INTERFACES

EQUIPMENT
VOLUME 4
PERIPHERALS A

EQUIPMENT
VOLUME 5
PERIPHERALS B

EQUIPMENT
VOLUME 6
PERIPHERALS C

VIII. COMPRINT 912 PRINTER USER'S MANUAL (BASE PRINTER FOR GP-100)

IX. EPSON RX-80 PRINTER OPERATION MANUAL

X. EPSON INTELLIGENT SERIAL INTERFACE USER MANUAL

EQUIPMENT
VOLUME 7
RTG

EQUIPMENT
VOLUME 8
ANALOGUE

VI. MONITRON VHF NBFM TRANSMITTER AND RECEIVER INSTRUCTION MANUAL

VII. TELEDYNE GEOTECH PRODUCT INFORMATION

EQUIPMENT
VOLUME 9
MISCELLANEOUS

EQUIPMENT
MICROFICHE SET 1
MANUALS

I. BA11-N MOUNTING BOX TECHNICAL MANUAL
   1. Introduction
   2. Unpacking, Installation and Operation
   3. BA11-N Power System Description
   4. Maintenance
   5. Backplane and Module Configurations

II. BDV11 BUS TERMINATOR, BOOTSTRAP AND DIAGNOSTIC ROM TECHNICAL MANUAL
   1. Introduction
   2. Installation
   3. Operation
   4. Technical Description
   A. ROM Specifications

III. LSI-11 PDP 11/03 USER'S MANUAL
   1. Introduction
   2. LSI-11 System Overview
   3. LSI-11 Bus
   4. LSI-11 Module Descriptions
   5. Using KD11-F and KD11-J Processors
   6. LSI-11 Interface Modules
   7. Using MSV11-B R/W Memory Modules
   8. Using MMV11-A Core Memory
   9. Using MRV11-A R/O Memory
   10. User Designed Interfaces
   11. System Configuration and Installation
   12. Peripherals
   A. Memory Map
   B. LSI-11 Bus Pin Assignments
   C. 7-Bit ASCII Code
   D. Summary of LSI-11 Instructions
   E. H9270 Backplane Configurations
   F. Bus Interface IC Pins
   G. LSI-11 Bus Accesory Options Installation and Operation
   H. DLV11 I/O Jumper Configurations

IV. MRV11-BA, MSV11-C, MSV11-D/E USER'S MANUALS
   1. Introduction
   2. Installation
   3. Technical Description
   4. (MRV11-BA Manual Only) Using MRV11-BC PROMS
   5. Maintenance (Chapter 4 in MSV11 Manuals)

ROM chips are 8316E with CS1,CS2,CS3 low	W5,W7 installed W6,W8,W13 removed
Execute CPU test on power-up or restart	E15-A1 ON
Execute memory test on power-up or restart	E15-A2 ON
No DECNET boot	E15-A3 OFF
Console test and dialogue	E15-A4 ON
DY0: boot	E15-A5,A8 OFF E15-A6,A7 ON E21-B1 OFF
No ROM Boot	E21-B2,B3,B4 OFF
LTC function is program controlled	E21-B5 ON

Digi-Data 1749-8-4-110-UL Tape Transport s/n 01881

Tape Unit 0	W8,W10 installed
Transport status gated by ARM I/O	W12 installed
WRITE MODE remains true unless SWS unused	W13 installed
EOT remains true after passing marker	W18 installed
Single density NRZ only unit	W19 installed
On-line control from front panel	W30 installed
45ips tape speed	S3-1,2 CLOSED S3-3,4,5,6 OPEN
9 track, 800 bpi, NRZ format	S1-2,3,6 CLOSED S1-1,4,5,7 OPEN W3, W24 installed
High Density lamp indicates EOT	W23 installed
On Line lamp indicates ON LINE	W27 installed
+5vDC test card supply disabled	W4 removed
Operate transport	S2 in center pos.

Lear Siegler ADM-3A Video Terminal s/n 43225

Baud rate: 1200	S1-6 ON
Full Duplex	S2-5 OFF
RS-232C communication	S2-6 ON
Auto NL after 80th character	S2-7 ON
Lower Case characteres enabled	S3-1 ON
Odd parity	S3-2 ON
8 data bits	S3-3 OFF
1 stop bit	S3-4 ON
Parity inhibited	S3-5 OFF
Bit 8 equals 0	S3-6 ON
24 line display	S4-1 OFF
60Hz refresh rate	S4-2 OFF
Remote (CTRL-Z) clear screen enabled	S4-3 OFF
Keyboard Lock enabled	S4-4 OFF
Upper/Lower Case display	S4-5 OFF
Destructive cursor	S4-6 ON
Local (direct to computer) mode	S5-1,2,3,4,5 OFF S5-6 ON
Block Cursor with cursor control	S5-7 ON
Normal operation	S6 OFF

Integral Data Systems IDS-440G Paper Tiger Printer s/n12575

Page length: 11 inches	S3-1,3 ON, S3-2 OFF
Baud rate: 1200	S3-4,5 ON
Control codes disabled	S3-6 OFF
Serial EIA interface	S3-7 ON
12 characters per inch	S4-1 OFF, S4-2 ON
8 lines per inch	S4-3 ON
Page skip over perforation disabled	S4-4 OFF
Auto LF on receipt of CR disabled	S4-5 OFF
Remote control deselect disabled	S4-6 OFF
60 Hz power supply	S4-7 OFF

EQUIPMENT
MICROFICHE SET 2
SOFTWARE

I. BDV11-AA DIAGNOSTIC

II. DEC/X11 PROCESSOR TEST

III. DEC/X11 BDV11 ROM CHECKSUM VERIFIER

IV. DLV11 DIAGNOSTIC TEST

V. LSI-11 BASIC INSTRUCTION TESTS

VI. LSI-11 DECIMAL INSTRUCTION TESTS

VII. LSI-11 MOVE STRING INSTRUCTION TESTS

VIII. LSI-11 EIS INSTRUCTION TESTS

IX. LSI-11 FIS INSTRUCTION TESTS

X. PDT-11/LSI-11 TRAPS TEST

XI. PDP11 MOS/CORE MEMORY EXERCISER

XII. RX211,RXV11 UTILITY DRIVER (BRUTE FORCE DRIVER)

Appendix E

COMPONENT DATA SHEETS

Note: Data sheets for components such as the LM105, the NE565, the 747 and other components are included as pages 117 to 149 of the original copy of this manual. Due to their availability outside of Antarctica they are not included in any other copies of this manual.

Appendix F

NOTES ON MCMURDO STATION

F.1 Finding Your Way Around

McMurdo Station is an amazing conglomeration of temporary structures, sewer lines and "boomtown" sprawl. Much can be said about how things have not necessarily been done in the most efficient manner, but such things are best left to be discovered first hand.

Upon first arrival to McMurdo, most people are transported from the runway to the Chalet, nerve center for civilian operations at McMurdo. A short briefing and keys to rooms await the new arrivals. Those who are in Antarctica on research grants (locally known as "Grantees") are usually housed either in the Hotel or the MMI, next to the Chalet.

From there, the first place to find is Building 155. This is the largest building on the continent, and houses the messdecks (cafeteria), ships store (gift shop), disbursing office (bank) and library (library). This is also the building where all winter-overs will live once the summer folks are gone.

As can be seen from the map in figure 1, the Infrasonics Lab is located some distance from the central station. Transport to the lab during the summer is usually by foot. During the winter a vehicle is provided for science support which is shared among all grantees, but is mainly used for transport to the Cosray and Infrasonics labs.

A few other buildings worth knowing about: The BFC is the field center, where equipment for field work may be checked out. The Foldaway is the center of USARP Construction, and houses most of the civilian utilities support offices. The Biolab is also the point of contact for obtaining any needs (from office supplies to distilled water) other than field equipment. MAC Center (Building 165) houses the Navy administrative offices, and (of particular interest) the communications center and weather office.

During the summer, most support needs are handled through the Chalet. This is where trucks are checked out, message traffic is sent and received, all flights (hercs and helos) are planned, and a multitude of crises are handled with ease. The Chalet staff are often overworked and deal with far too many people who are more demanding than understanding. It pays to treat them well, and to keep in mind that there are other needs besides your own.

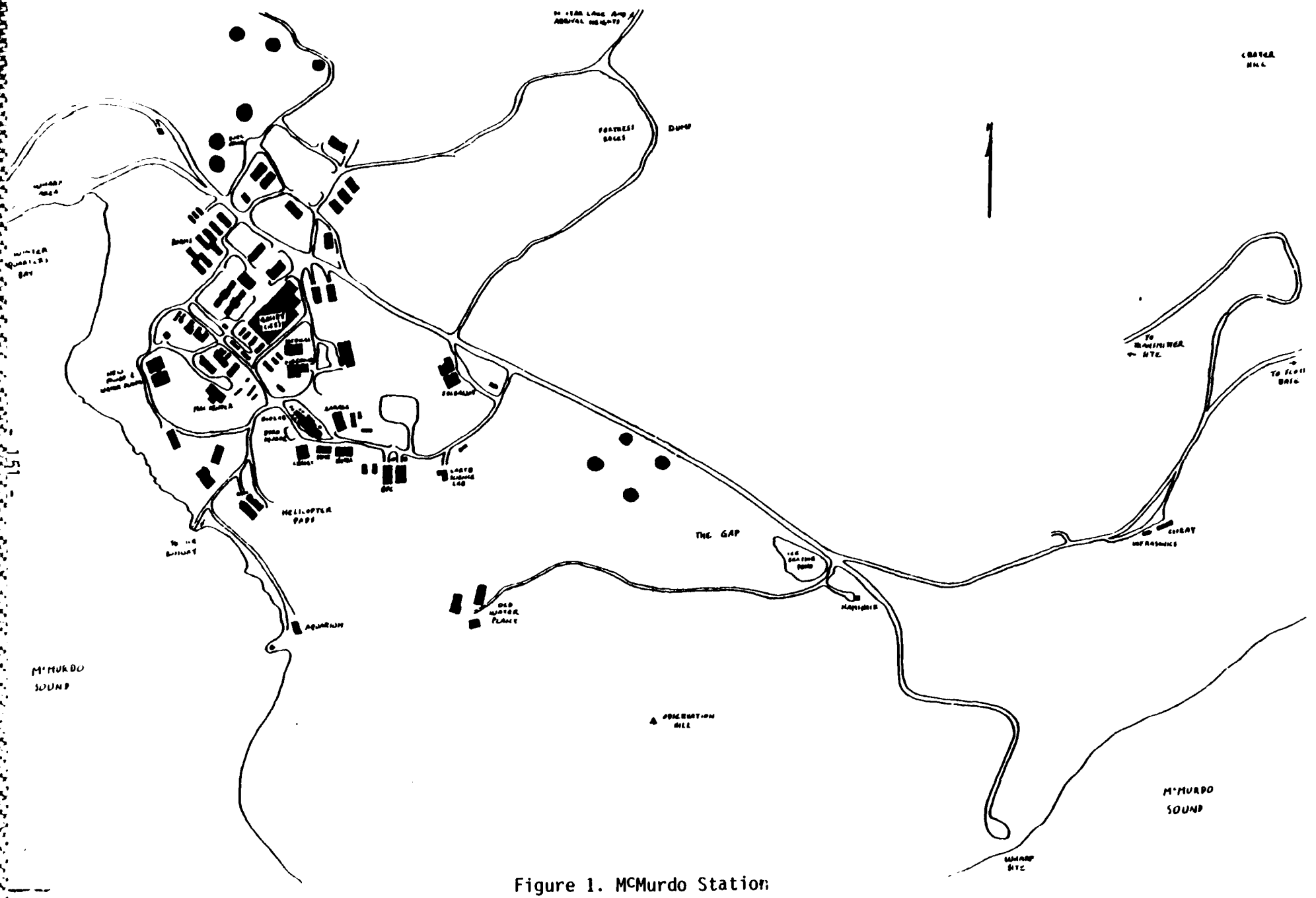


Figure 1. McMurdo Station

F.2 Postal and Telecom Services

There are a number of postal and telecom services available at McMurdo or through New Zealand's Scott Base. US Mail is delivered regularly when there are flights, and is usually sorted within six hours of the flight arrival. All civilian mail is sorted into pigeonholes in the mail room upstairs in the Hotel. A flag is flown from the Hotel once the mail has been sorted.

The address for US mail to be delivered to McMurdo Station is:

Box 700, USARP
%NAVSUPPFORANTARCTICA
FPO San Francisco, CA 96601 (or 96692 for winter-over personnel)

In addition, mail may be received through the New Zealand postal system via two routes. These are:

%NSF Representative New Zealand
US Navy Post Office
Private Bag — delivered as Guard Mail from
Christchurch — Christchurch to McMurdo
NEW ZEALAND

or

Infrasonics
Scott Base — delivered as NZ Mail to
%CPO Christchurch — Scott Base
NEW ZEALAND

All mail enroute to Antarctica (and much of it returning from Antarctica) is searched by customs officials for any illicit materials (drugs, agricultural products, meats) or customs violations. US Mail requires the same postage as if mailed to San Francisco. Mail addressed to either of the New Zealand addresses must carry the appropriate international postage.

Both the Navy Post Office in McMurdo and the NZ Post Office at Scott Base provide the full range of postal services. The NZ system is often faster for mail addressed to places other than the USA. In addition, Ross Dependancy (Antarctic) stamps and postmarks are available for mail posted at the Scott Base Post Office. (This is the only post office in the world where Ross Dependancy stamps are valid.) All packages sent from McMurdo must bear a customs declaration on the outside of the package. Registered mail may be sent from McMurdo only between October and February.

One advantage of the Scott Base Post Office is quick service for processing film. A Kodak mailer sent to Kodak, P.O. Box 3003, Wellington, will often be returned to Scott Base within three weeks. Sometimes it can take this long just for mail to reach the states. Kodak mailers are available in the Ships Store.

Telegram services are also available both through the Navy and NZ systems. Telegrams sent to McMurdo may be addressed:

PMS (your name)
C/O NSF REPRESENTATIVE
MCMURDO STATION
ANTARCTICA
PLEASE ROUTE THRU:
NAVAL AIR STATION
STOCKTON CA

These telegrams are only charged for transmission to Stockton, CA. Telegrams may also be sent via the New Zealand system. The address is:

(your name), INFRASONICS
SCOTT BASE
NEW ZEALAND

Limited telephone services are also available to Ross Island. Through the MARS (Military Affiliate Radio Service) system phone patches may be initiated from McMurdo to any location in the states. A MARS operator in the states will place a collect phone call to the destination party. The circuit is one-way, which means that each party must indicate when they are finished speaking by saying "OVER." This lets the radio operators know when they should key (or unkey) the microphone. Phone patches are subject to all kinds of radio interference and are inherently unreliable.

The Scott Base post office also maintains a telephone circuit. This circuit is a private, and two-way circuit. Also, since they are only transmitting to New Zealand and have a number of frequencies to choose from, this circuit is much more reliable than the phone patches. International calls may be placed from Scott Base, and these go by satellite from New Zealand. Calls must be booked in advance, and must either be collect or paid in cash upon completion of the call. If paid in cash, the cost is NZ$2.80 per minute; if collect the cost is somewhat higher. During the summer they are usually limited to 10 minutes. Calls may also be initiated from anywhere in the world to Scott Base. The procedure to book a southbound call is to contact the New Zealand Island Services operator and set up a booking for a call to Scott Base.

F.3 Weather and Climate

The McMurdo climate is somewhat temperate (for the continent) due to its coastal location. Summer temperatures hang between -10 and +2 degrees Celsius, and winter temperatures are generally in the -20 to -30 degrees Celsius range. Spring and fall generally bring stormy weather, while summer and winter are generally crisp and clear. In practice, however, the weather is not terribly predictable.

McMurdo Station has established a system of Weather Conditions, in an effort to promote safety. Condition III is the normal condition, which means that things aren't too bad. Condition II is set whenever winds are above 40 knots, visibility is less than 1/4 mile, or the effective wind chill factor is colder than -70 degrees Fahrenheit. During condition II, travel outside of the station complex is only permitted in radio equipped vehicles. (The Infrasonics lab is outside of the station complex.) Condition I is set whenever the winds are above 55 knots, visibility is less than 100 feet, or the effective wind chill factor is colder than -100 degrees Fahrenheit. During Condition I, no travel outside of buildings is permitted. Sometimes a Condition I Modified is set, which means the conditions are Condition I, but travel within the station complex is permitted.

There are two spots along the road from the station complex to the Infrasonics lab which are prone to snowdrift formation. One of these is just a few yards from the driveway to the lab. Care should be taken during blowing snow conditions as the visibility in these snowdrift spots is always much worse than the rest of the road.

F.4 Obtaining Supplies

During the summer, most needs will be supplied through the support of the civilian contractor staff. However, during the winter, most of these people go home, and you will be on your own to requisition items from GSk (Sears South). Figure 2 is a list of some useful items that may be requisitioned from GSk.

How to fill out 1250 (GSK) requisition chits:

1. Today's date: last digit of year followed by 3-digit julian day
2. Enter: "Infrasonics"
3. Enter: "C"
4. Required delivery date: normally one week after today's date (same format)
8. Name of item
13-15. JCN: R55291 4AA 553
E. Proj: DX8
21-22. NSN (see below)
24. Unit of issue (EA, BX, PK, RO, BD, etc)
25. Quantity desired
29. GSK description of item required
    and "Infrasonics, x253"

Some useful GSK items.

Common name	NSN	GSK Description
Acetate (gummed)	9330-00-618-7218	Plastic sheet, P/S adhes coated, 4x3 100/bx
Allen wrenches	5120-00-595-9244	Key set, socket headscrew
Ball point pen	7510-00-935-7135	Pen, ball point, fine tip, retract, black
Ball point pen	7510-00-664-5197	Pen, ball point, fine tip, non-retract, red
Battery, 9v	6135-00-900-2139	Battery, 9v, Duracell
Battery, 67.5v	6135-00-120-1005	Battery, BA-51, 67.5v, snap connectors
Cotton swabs	6515-00-303-8250	Applicator, wood, cotton tip, 6", 100/pk
Document prot.	7510-00-286-1407	Document protector
Doormat	7220-00-205-3099	Mat, floor, (coir fibre), 18" x 30"
Elec. tape	5970-00-955-9976	Tape, insulation, electrical, rubber
Eraser	7510-00-285-2814	Eraser, soft pink
Eraser (pencil)	7510-00-634-5352	Eraser, rubber, fits over pencil end
Felt tip pen	7520-00-904-1265	Marker, tube type, fine point, black, 12/bx
Felt tip pen	7520-00-904-1266	Marker, tube type, fine point, red, 12/bx
Felt tip pen	7520-00-904-1267	Marker, tube type, fine point, green, 12/bx
Felt tip pen	7520-00-904-1268	Marker, tube type, fine point, blue, 12/bx
Filing folders	7530-00-291-0098	Folder, file, lightweight, manila
File handle	5110-00-595-8325	Handle
Grease pencil	7510-00-174-3205	Pencil, spiral wrap, wax, red
Grease pencil	7510-00-436-5210	Pencil, spiral wrap, wax, blue
Grease pencil	7510-00-223-6672	Pencil, mechanical, wax, black
Hacksaw	5110-00-289-9657	Frame, hand hacksaw
Hacksaw blade	5110-00-243-0901	Blade, hacksaw, 12", 24 tpi
Handle	5340-00-514-0491	Handle, bow
Hydrometer	6630-00-171-5157	Tester, battery
Index tabs	7510-00-147-8477	Tab, index, 1/2", clear
Index tabs	7510-00-285-5797	Tab, index, 1/2", pink
Index tabs	7510-00-285-5798	Tab, index, 1/2", red
Index tabs	7510-00-285-5799	Tab, index, 1/2", green
Index tabs	7510-00-082-2601	Tab, index, 1/2", blue
Index tabs	7510-00-082-2602	Tab, index, 1/2", green
Index tabs	7510-00-082-2603	Tab, index, 1/2", orange
Index tabs	7510-00-082-2604	Tab, index, 1/2", pink
Latch	5340-00-240-2310	Bolt barrel, brass, 2 1/2"
Masking tape	7510-00-266-6710	Tape, packaging/masking, paper
Muffin fan	4140-00-113-0989	Fan, electric, 4 3/4 x 4 3/4 x 1 5/8, 110v AC
Notebook	7510-00-530-8881	Binder, loose leaf, 3 ring, 2" cap., black
Nutdriver 5/32	5120-00-585-2149	Driver, socket, 5/32"
Nutdriver 3/16	5120-00-224-2599	Driver, socket, 3/16"
Nutdriver 9/32	5120-00-277-1802	Driver, socket, 9/32"
Nutdriver 11/32	5120-00-180-2951	Driver, socket, 11/32"
Nutdriver 3/8	5120-00-596-1263	Driver, socket, 3/8"
Nutdriver 7/16	5120-00-222-1499	Driver, socket, 7/16"

Figure 2

Nutdriver 1/2	5120-00-293-0375	Driver, socket, 1/2"
Paper clips	7510-00-161-4292	Clip, paper, wire, type I, gem pattern, 100/bx
Paper tape	7530-00-664-0107	Tape, teletypewriter, yellow, perforator
Pencils	7510-00-281-5234	Pencils, lead, type IV, #2 medium, 100/bx
Pencil sharpener	7520-00-162-6178	Sharpener, pencil, type II
Plastic bags(lg)	8105-00-655-8286	Bag, plastic, 19 x 14 x 38, 125/bx
Plastic bags(sm)	8105-00-655-8285	Bag, plastic, 10 x 12 x 25, 250/bx
Pocketknife	5110-00-530-1757	Knife, pocket,cutting blade & marlinspike
Poster paper	9310-00-223-0368	Railroad board, 22x28x.048, 150sh/bx
Printer ribbon	7510-00-082-2649	Ribbon, teletype (will work on IDS-440)
Refl. tape (gr)	9390-00-558-0216	Tape, reflective, green
Refl. tape (or)	9390-00-558-0219	Tape, reflective, orange
RTV (liquid)	8040-00-145-0075	Adhesive, RTV, Type II, white, 3oz
RTV (liquid)	8040-00-833-9563	Adhesive, RTV, Type II, white, 5oz
RTV (paste)	8040-00-877-9872	Adhesive, RTV, Type I, white, 3oz
RTV (paste)	8040-00-902-3871	Adhesive, RTV, Type I, red, 3oz
RTV (paste)	8040-00-701-9546	Adhesive, RTV, Type I, clear, 5oz
RTV (paste)	8040-00-928-7385	Adhesive, RTV, Type I, black, 12oz
Rubber bands	7510-00-205-1439	Rubber bands, 1000/bx
Ruler	5210-00-826-8298	Rule, steel, machinists, 6"
Scissors	5110-00-161-6909	Shears, straight trimmers, 9"
Scotch tape	7510-00-551-9823	Tape, P/S, cellulose, acetate, 3" i.d. roll
Skilsaw	5130-00-889-8989	Saw, circular, port., elec., 8 1/4" blade
Socket set	5120-00-081-2305	Socket set, 1/4" drive
Solder gun tip	3439-00-540-8998	Tip, elec. soldering gun, small
Space heater	4520-00-555-8696	Heater, electric
Staplegun	5120-00-889-1796	Tacker, heavy duty, type II
Staples	7510-00-272-9662	staples, paper fastening, office type, 5000/bx
Strapping tape	7510-00-290-8035	Tape, P/S, filament reinforced, 3/4"
Stepladder	5440-00-227-1593	Step ladder, wood, 6ft
Thumb tacks	7510-00-272-6886	Thumb tacks, solid head, 100/bx
Toil. pap. hold.	4510-00-364-3035	Holder, toilet paper
Wastebasket	7520-00-281-5911	Basket, waste paper, gray, small
Water jug	7330-00-893-8550	Jug, insulated, 5gal
Ziplock bags	8105-00-837-7755	Bag, interlocking seal, 9"x8"x.004, 1000/bx

Figure 2 (cont'd)

Appendix G

TCK8CH SYSTEM MANUAL

```
TTTTT   CCC   K   K   888    CCC   H   H
  T    C   C  K  K   8   8  C   C  H   H
  T    C      K K    8   8  C      H   H
  T    C      KK      888   C      HHHHH
  T    C      K K    8   8  C      H   H
  T    C   C  K  K   8   8  C   C  H   H
  T     CCC   K   K   888    CCC   H   H


 SSS   Y   Y   SSS   TTTTT  EEEEE  M   M
S   S  Y   Y  S   S    T    E      MM MM
S       Y Y   S        T    E      M M M
 SSS     Y     SSS     T    EEEE   M M M
    S    Y        S    T    E      M   M
S   S    Y    S   S    T    E      M   M
 SSS     Y     SSS     T    EEEEE  M   M


M   M    A    N   N  U   U    A    L
MM MM   A A   N   N  U   U   A A   L
M M M  A   A  NN  N  U   U  A   A  L
M M M  A   A  N N N  U   U  A   A  L
M   M  AAAAA  N  NN  U   U  AAAAA  L
M   M  A   A  N   N  U   U  A   A  L
M   M  A   A  N   N   UUU   A   A  LLLLL
```

COLLECTED NOTES, GENERAL AND TECHNICAL INFORMATION ON THE
OPERATION OF THE INFRASONIC OBSERVATORY AT TENNANT CREEK, AUSTRALIA

TABLE OF CONTENTS

SYSTEM OVERVIEW

The Tennant Creek Infrasonic System consists of three major parts: a) the sensor elements and transmission lines, b) the demodulating and filtering system, and c) the digital data acquisition and analysis system. The first of these is the Warramunga Infrasonic Array operated by the RSES, and the latter two were built and supplied by the Geophysical Institute.

A two-dimensional Daniels Space Filter is connected to one side of the microphone capsule. There is a backing or reference volume of air connected to the other side. An air pressure difference between air in the hose and that in the backing volume causes the diaphragm to move, thus changing the capacity of the microphone. Normal capacitance is about 100pf. A Wein Bridge Oscillator is connected to the microphone. The microphone's capacitance inversely controls the oscillator's frequency. The output of the oscillator is thus a frequency modulated audio tone. A higher outside air pressure than in the backing volume raises the frequency above its normal 1500 Hertz. A slow leak is connected across the microphone diaphragm to compensate for changes in pressure of longer than about two minutes. The direct current power for the oscillator and the audio output are connected to the demodulating system via overhead transmission lines. There are seven sensors in the system.

In the main building, the audio tones are demodulated and filtered, and the data recorded and analyzed. The demodulator panels were built by the Geophysical Institute. The audio tone is demodulated with a phase-locked loop. The result is a signal representing the movement of the microphone diaphragm. The signal is filtered using active filters with a bandpass of 7 to 70 seconds for the "N-7" or "F" array, or a bandpass of 1 to 10 seconds for the "N-6" or "T" array. The signal is amplified and fed to the analog-to-digital converter.

The digital system is an LSI-11 based microcomputer which collects, analyzes and stores the data as received from the demodulator. The system is configured to operate as a PDP-11 computer built by Digital Equipment Corp. (DEC), with peripherals for data acquisition, operator communication, a clock, and data storage. The system operates using software developed by B. David Spell, and is intended to operate continuously without operator intervention.

The demodulated signal is sampled by an Analog-to-Digital converter, model DT2762, built by Data Translation. The software routine A2DRTG handles operation of the A/D converter. T array signals are sampled at 4 Hz and F array signals at 1 Hz, with the sampled data being stored in a buffer. After 128 seconds, the buffer is written onto magnetic tape, and the 128 second data block is analyzed by the various software routines that make up the RTGAIW software ensemble. Data acquisition of the next 128 second block continues while the current block is being analyzed.

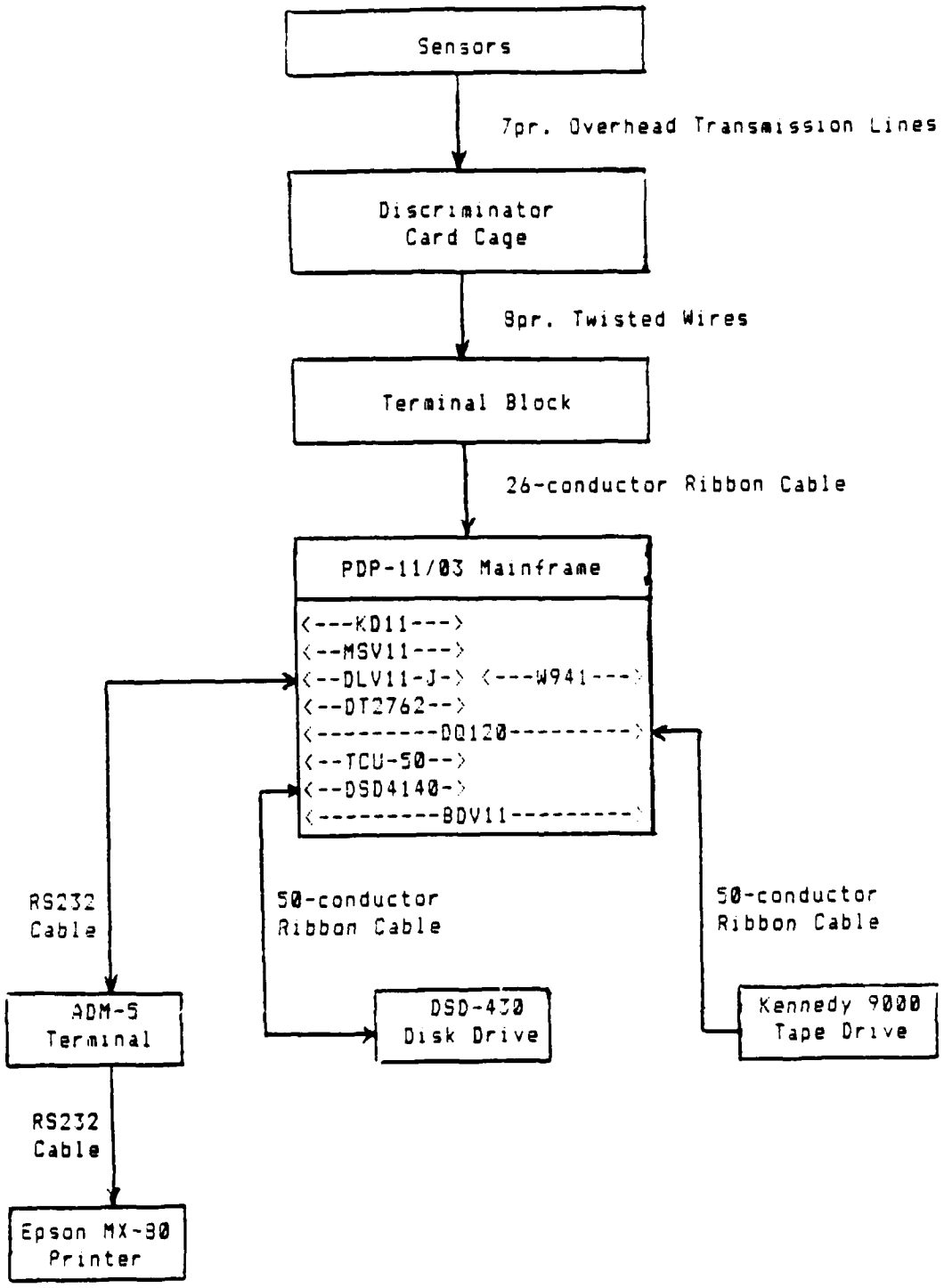
Real-time analysis provides data statistics, cross-correlation, azimuth and velocity of signal approach, and pure-state filtering. Data statistics include maximum, minimum, and average values, root-mean-square and standard deviation of each channel. Cross-correlation analysis compares to laying one signal trace on top of another and sliding it back and forth to find the best fit. Time difference between the two channels and relative correlation (on a scale of zero to one) are determined for the best-fit case for each of the six station pairs. The relative value of cross-correlation is used as an indication

of signal presence and strength. The time lag information is used to find the azimuth of approach and trace velocity of the signal. The data is then filtered using a data-adaptive filtering technique developed by Samson and Olson. The above analysis routines are then performed on the filtered data.

Data for the T array is analyzed first. Data for the F array is added to the data from the three previous blocks, and analyzed as a 512 second time block. Upon completion of the F array analysis, the first 128 seconds of data are discarded, and the remainder is saved for use with the next block.

All analysis results are communicated to the video terminal and parallel printer, and are also written into the trailer of the next data block on the magnetic tape. Because of the time required for analysis, the trailer data applies to the raw data stored one block earlier on the tape.

SYSTEM BLOCK DIAGRAM



SYSTEM SPECIFICATIONS

Sensors

Transducer can	Model N4
Microphone diaphragm	Model N2
nominal capacitance	100pf
Oscillator	Model N2
recommended current	19mA

Sensor stations

#0	site 1	x = 0.0	y = 0.0
#1	site 2	-1432.0	-2520.0
#2	site 3	-3897.0	-1098.0
#3	site 4	-2460.0	1372.0
#4	site 1	0.0	0.0
#5	site 6	363.0	407.0
#6	site 7	-700.0	678.0
#7	site 5	-1970.0	-524.0

Discriminators

Audio tone frequency	1.15-1.65 KHz
Full scale deviation (10 dynes)	+/- 10Hz
N-7 bandpass (channels 0,1,2 & 3)	7-70 seconds
N-6 bandpass (channels 4,5,6 & 7)	1-10 seconds
Chart recorder output	+/- 0.5mA into 5.6K

Digital System

Mainframe	Digital PDP-11/03	
LSI-11/2 processor	KD11,KEV11	M7270
32K x 16 MOS memory	MSV11-DD	M8044-DB
4-channel serial line unit	DLV11-J	M8043
4-Hz conversion trigger	(GI built)	W941
A/D Converter	Data Translation DT2762	
Sampling rate	1Hz for N-7, 4Hz for N-6	
Tape drive controller	Dilog DQ120	
Real-time clock	Digital Pathways TCU-50 DYR	
Disk drive controller	DSD 4140	
Diagnostic bootstrap terminator	BDV11	M8012
Data storage	Kennedy 9000 tape drive	
Storage medium	10" reel magnetic tape	
Disk drive (for program development)	DSD 430, RX02 equivalent	
Terminal	Lear-Siegler ADM-5	
Printer	Epson MX-80III	
serial interface	Comrex Gold Eagle	
Power consumption (entire system)	2.5 Kilowatts	
Environment	Clean-room reccommended	
Nominal temperature	62F deg (18C deg)	
Nominal humidity	40-45%, non-condensing	

Legend for Rev 19 and greater listings

n.b. Sigma is standard deviation, Psi is RMS (root-mean-square), Mu is average, Rho is cross-correlation coefficient, az is azimuth of approach, and vel is trace velocity. I prefix means Integer (I*2) and all others are real (R*4). Date and time are in a form described in the literature.

```
.....................................................................
 1 Iblock nr / Ihard errors / Iskew errors / Ioverrange / Iunderrange
 2 station code / date / time
 3 Iblock nr / 0 / az sigma / vel sigma , (last bk of interest) / az / vel
 4 Time delays: 4-5 / 4-6 / 4-7 / 5-6 / 5-7 / 6-7 / average Rho
 5 individual Rho's: 4-5 / 4-6 / 4-7 / 5-6 / 5-7 / 6-7
 6 ch 4: Imax / Imin / Mu / Sigma / Psi
 7 ch 5: same as line 6
 8 ch 6: same as line 6
 9 ch 7: same as line 6
10 Iblock nr / spectral peak / same as line 3 (after filtering)
11 same as line 4 (after filtering)
12
13 Iblock range / same as line 3
14 Time delays: 0-1 / 0-2 / 0-3 / 1-2 / 1-3 / 2-3 / average Rho
15 individual Rho's: 0-1 / 0-2 / 0-3 / 1-2 / 1-3 / 2-3
16 ch 0: same as line 6
17 ch 1: same as line 6
18 ch 2: same as line 6
19 ch 3: same as line 6
20 Iblock range / same as line 10
21 same as line 14 (after filtering)
.....................................................................
```

Lines 1 and 2 are general
Lines 3 through 11 are T array
Lines 13 through 21 are F array
Lines 3, 10, 13, or 20 will not print if velocity is out of range

GENERAL OPERATING PROCEDURES

CALIBRATION: Calibration refers to the adjustment of the amplifier section of the discriminator card, and the determination of the number of digital "counts" recorded per microbar of pressure change. Preferably, this should be done annually. First, disconnect the EA recorder from any input and check the mechanical zero. This is accomplished by moving the needle at the bottom of the recorder. When the recorder is reconnected, set the knob to the right of the discriminator cards to "Zero Set," and the toggle switch on the discriminator card to the "down" (LP zero) position. Now, adjust the trimpot just above the toggle switch to electrically zero the recorder. Return the toggle switch to the up position. Now adjust the HP zero using the two trimpots just below the toggle switch. The one on the left is the coarse adjustment, and the one on the right is the fine adjustment. Now return the knob at the right to the "Operate" position.

When you have finished with the zero adjustments for all of the channels, you are ready to begin the calibration process. Open the back panel of the card cage and desolder the EA equivalent load resistance from the output banana plugs before connecting the EA recorder. Turn on the calibrator and wait at least two minutes after the motor starts for all transients to settle before continuing. The calibration adjustment is made using the top trimpot. A clockwise turn will increase the amplitude. The peak to peak measurement of the calibration signal as recorded by the EA stripchart recorder should be ten centimeters. Be sure to let transients settle after each adjustment. When you are satisfied, let the calibration signal run for 30 minutes (15 minutes for N-6 channels) to allow the digital system calibration information to be recorded. Turn off the calibrator motor and wait another 10 minutes before returning the calibrator valve to the operate position. Disconnect the EA recorder and replace its equivalent resistance.

Record the following information in the log: the time that the valve is closed, the time that the pump is started, the time that the calibration signal has been adjusted satisfactorily, the frequency swing and the magtape block numbers during the 30min (or 15min) digital calibration check, the time that the pump is stopped, the frequency and the magtape block numbers during the quiet test, and the time that the valve is reopened.

DIGITAL SYSTEM: The main data collection/analysis is performed by the PDP-11 computer. It is of the utmost importance that data logging by this system continue uninterrupted. The operator should constantly keep a watch on the operation of this system.

The system will operate without operator intervention once it has been started with the exception of the tape change (approx. every five days). To initiate a tape change, the operator should enter a "SHIFT R" on the terminal. When the system completes the analysis of the current data block, it will write two end-of-files, rewind the tape, and issue the message "PAUSE--Mount tape." When the tape has been removed from the tape drive, the heads should be cleaned and a new tape mounted. Enter "RETURN" on the terminal and answer the program start questions. Samples are given below of the program start-up dialogue. Data collection and analysis should now continue without further intervention. Be sure to remove the write-ring from the old tape. Also be sure that the old tape is marked with the tape number, station name, program revision number, start time, stop time, number of blocks, and number of end-of-files. Tapes should be numbered according to the scheme "MTyy-xx" where yy is the year and xx is the tape number.

The nature of the digital data acquisition system is such that starting the system is fairly complex. The program information is loaded from magnetic tape in order to increase the available memory space. The system is brought to life through the use of four bootstraps, each building from the point where the previous one left off. The first of these is entered into the computer by the operator, and consists of 16 six-digit integers. The execution of this first bootstrap will cause the succeeding bootstraps to be read from the magnetic tape and executed. Finally, the current revision of the TCK8CH program will be loaded into the computer, and program execution will begin by rewinding the program tape, and issuing the message "PAUSE--Mount tape." This procedure is described in more detail in the TCK8CH section of the "TCK8CH System Manual" notebook.

Sample startup dialogue with no changes:

```
TCK8CH Rev 22.
Tape unit is ON LINE and tape is at BOT!
Tape unit is ready!
Tape is NOT write protected (ring is in)-do you want to reinitialize? <Y or N> N
Do you want an immediate EOF (end-of-file) to precede the data? <Y or N> N
Year? 84
Time: 21-JAN-84 18:41 18"Z?? Y
Changes? N
```

Sample startup dialogue with incorrect time and channel 6 inoperative:

```
TCK8CH Rev 22.
Tape unit is ON LINE and tape is at BOT!
Tape unit is ready!
Tape is NOT write protected (ring is in)-do you want to reinitialize? <Y or N> N
Do you want an immediate EOF (end-of-file) to precede the data? <Y or N> N
Year? 84
Time: 19-JAN-84 18:24 37"Z?? N
Correct time? (Y,M,D,H,M) 84,1,21,18,41
Time: 21-JAN-84 18:41  0"Z?? Y
Changes? Y
F,T or B? B
F array: 3 or 4? 4
T array: 3 or 4? 3
Missing channel <4,5,6,7 (or 8 if none)>: 6
A2D channels (missing channel in 4th position): 0,1,2,3,4,5,7,6
 0  1  2  3  4  5  7  6
```

HARD COPY: The Epson RX-80 printer is used to make hard copy of the TCK8CH output. This serves as a backup since all of the information is also stored on the data tapes, but is necessary in case of tape-drive failure. The system will go through a case of paper in about three weeks. The printer should be checked at least daily to insure proper operation, and that output paper is stacking properly. Improper stacking of the output paper can cause the input paper to be jammed, which can result in damage to the printer. The printer ribbon should be changed after every 2 or 3 weeks, and the print head cleaned monthly.

DEMODULATORS

There is one card cage for the demodulator cards. The right half holds the N-6 array cards, and the left half holds the N-7 cards. The following pages include a description, a schematic, photos, additional notes and schematics. There are spare cards for each array.

The signal input for each channel is a 1.5KHz tone from the microphone oscillator. A phase-locked loop is used to demodulate this FM tone. The demodulated signal is then filtered to remove components outside of the desired passband in a two stage active filter. This filter is designed to be flat within 1.5dB for periods of 10 to 67 seconds (N-7 array) or 1 to 10 seconds (N-6 array) when calibrated for full scale with a 15 second (N-7) or 5 second (N-6) period signal. The filter output will drive a standard E.A. strip chart recorder. A second output is provided to drive the electronics of the slow-speed analogue tape recorder. The inputs and outputs of the card cage are through the banana plugs on the back of the unit.

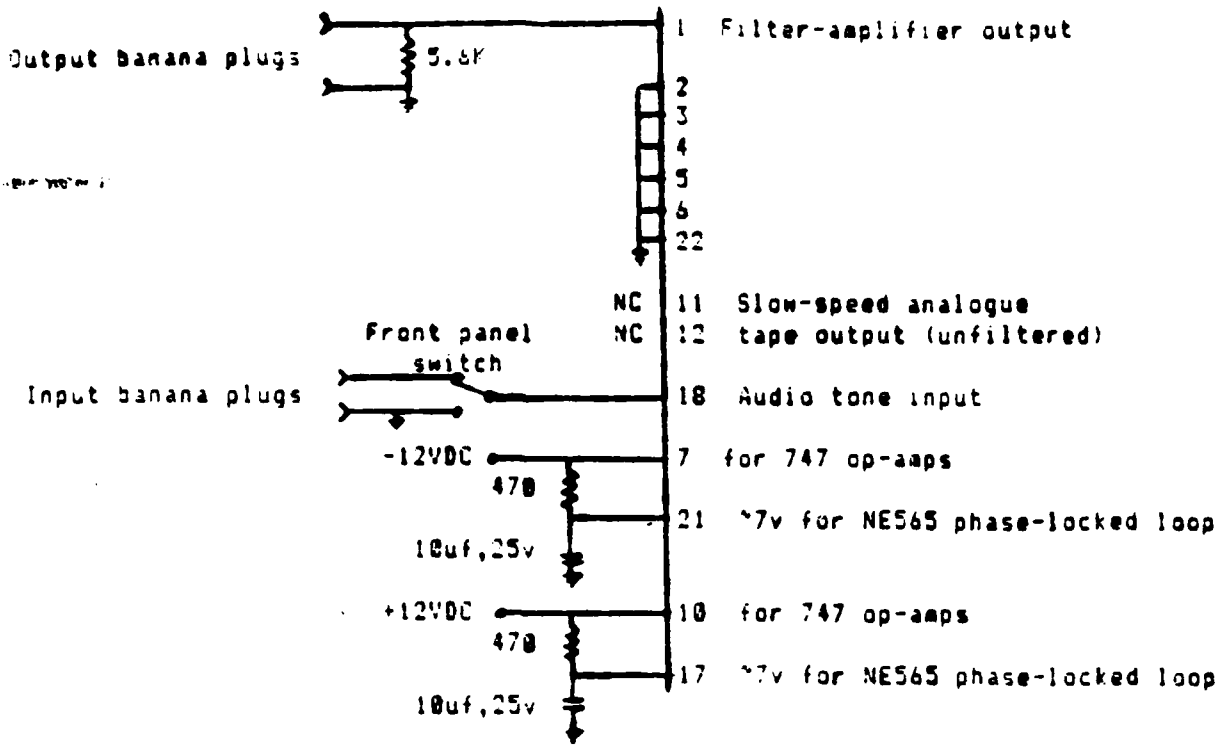
When in normal operation, the toggle switch on each card should be in the up (run) position. The right panel knob should be in the "Operate" position The "Zero Set" position of the right panel knob disconnects the filters from the input signals, allowing the output to settle to the zero position.

Zero adjustments should be checked annually (just prior to calibration). There are three steps in the adjustment process: mechanical zero, low-pass zero, and high-pass zero. During these steps the right panel knob must be left in the Input Grounded position. First, unplug the E.A. recorders from the equipment and check the mechanical zero. This can be adjusted by moving the needle at the bottom of the recorder unit. Second, plug the recorders back in and turn the toggle switches on the cards to the down (zero check) position. This puts a zero into the low pass filters. Now adjust the trimpot immediately above the toggle switch to center the pens (clockwise moves the pens in a positive direction). Third, return the toggle switches to the up (run) position and, if needed, adjust the high pass filters with the trimpots immediately below the switch. The trimpot on the left is the coarse adjustment and the one on the right is the fine adjustment (clockwise moves the pens in a negative direction). Now return the right panel knob to the Operate position.

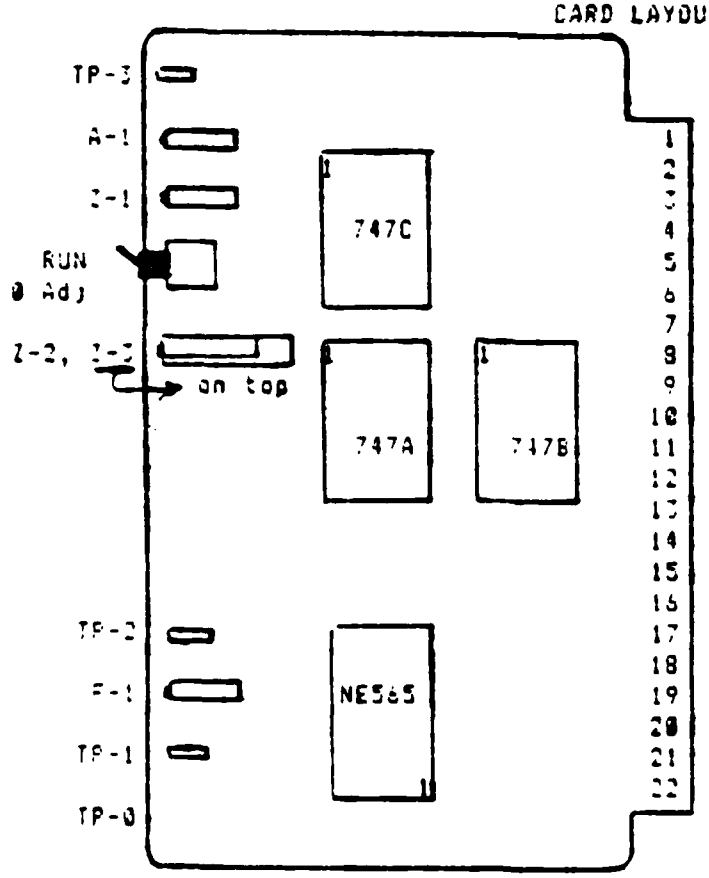
The equipment will give a full scale output (+/- 0.5ma into a 1.5K load) with a standard +/- 10Hz FM modulation of the 1.5kHz tone at a 15 second (N-7) or 5 second (N-6) period. This is the standard signal provided by the 10 dyne microphone calibrator bellows. For calibration, the bellows is hooked to the field microphone and left to run for several minutes. The top trimpot on the discriminator card is then adjusted to give a 10cm peak to peak output. Calibration signals up to +/- 50% of standard can be adjusted to full scale with this control. If the signal is outside of this range, the field unit should be serviced to bring it up to standard. The frequency of the 1.5kHz tone is not critical and may be anywhere between 1.15KHz and 1.65KHz. Varying temperatures in the field will cause the center frequency to change.

Any failure common to all of the four channels in a cage shows a problem with the 24v power supply. This is a plug-in unit, and may be replaced with one of the spares. A failure of one channel shows a problem with the card for that channel. This can be serviced by replacement with one of the spare cards.

DEMODULATOR CARD CAGE



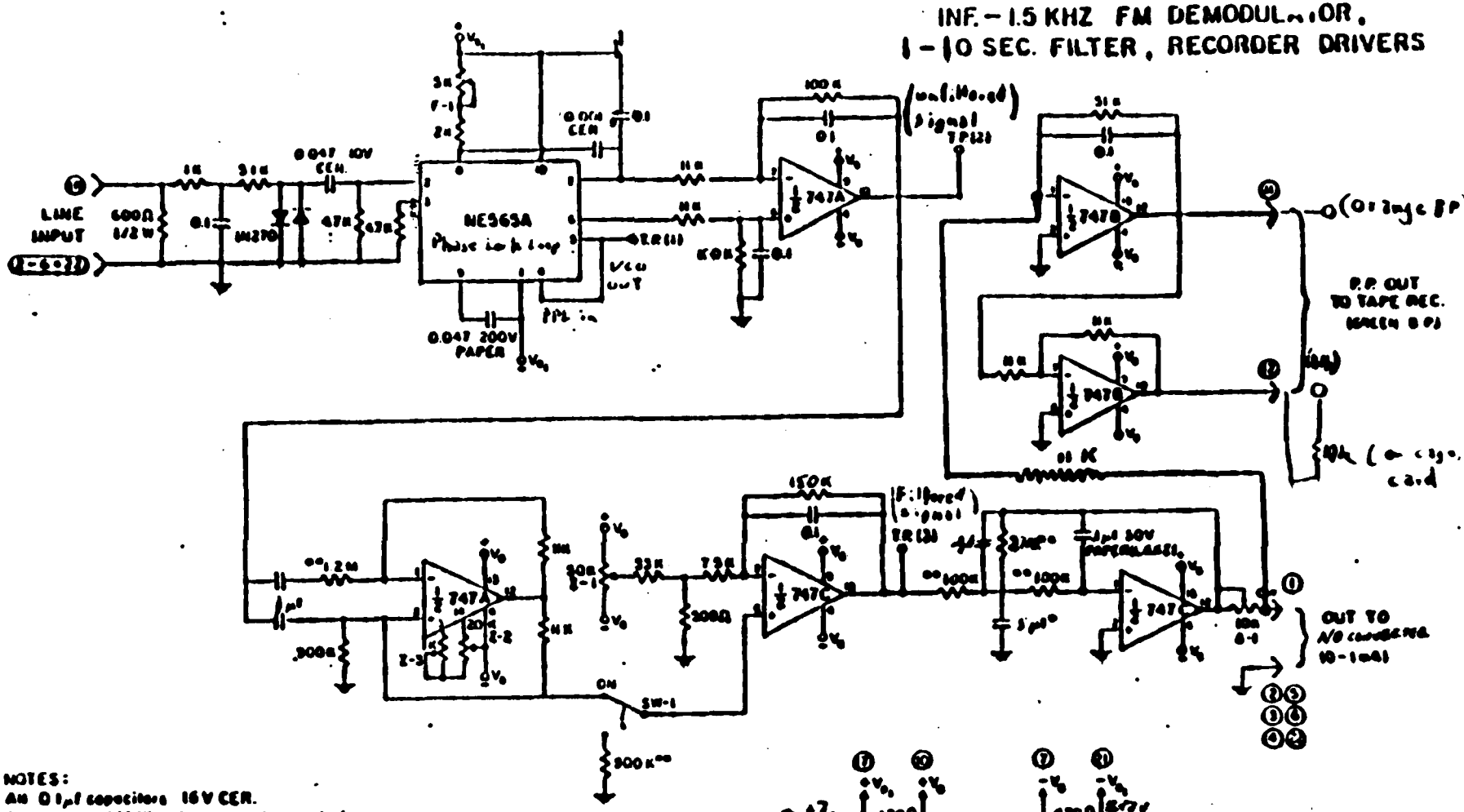
CARD LAYOUT



Test points:
- TP-0 ground
- TP-1 PLL freq. check
- TP-2 filter input
- TP-3 filter-amp out

Adjustments:
- F-1 PLL freq. adj.
- Z-1 LP zero
- Z-2 HP zero (coarse)
- A-1 output amplitude

INF. – 1.5 KHZ FM DEMODULATOR, 1 – 10 SEC. FILTER, RECORDER DRIVERS

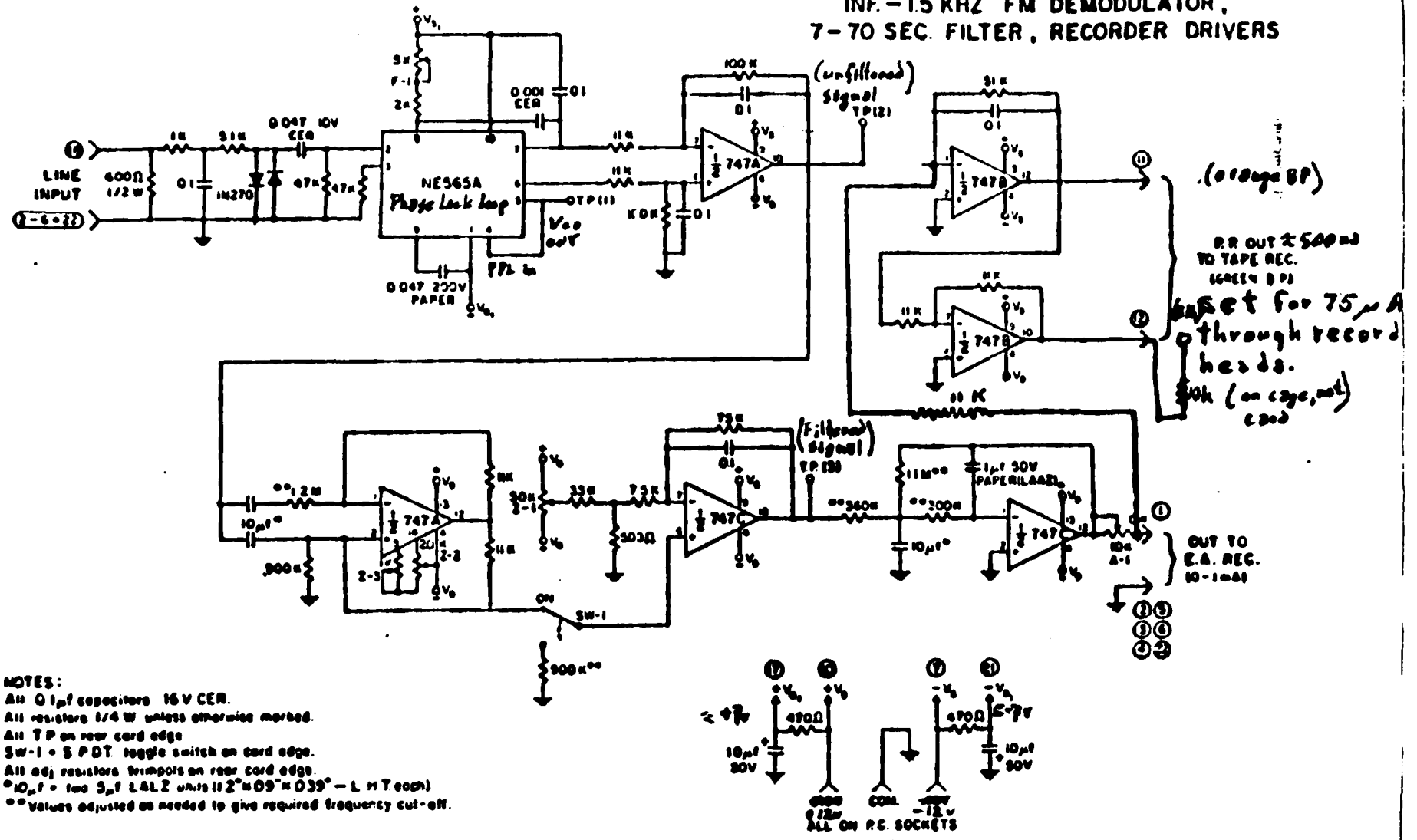


NOTES:
All 0.1µf capacitors 16 V CER.
All resistors 1/4 W unless otherwise marked.
All T P on rear card edge.
SW-1 = S.P.D.T. toggle switch on card edge.
All adj. resistors trimpots on rear card edge.

**Values adjusted as needed to give required frequency cut-off.

Serial A SCB only
and A WBA

INF. – 1.5 KHZ FM DEMODULATOR, 7 – 70 SEC. FILTER, RECORDER DRIVERS



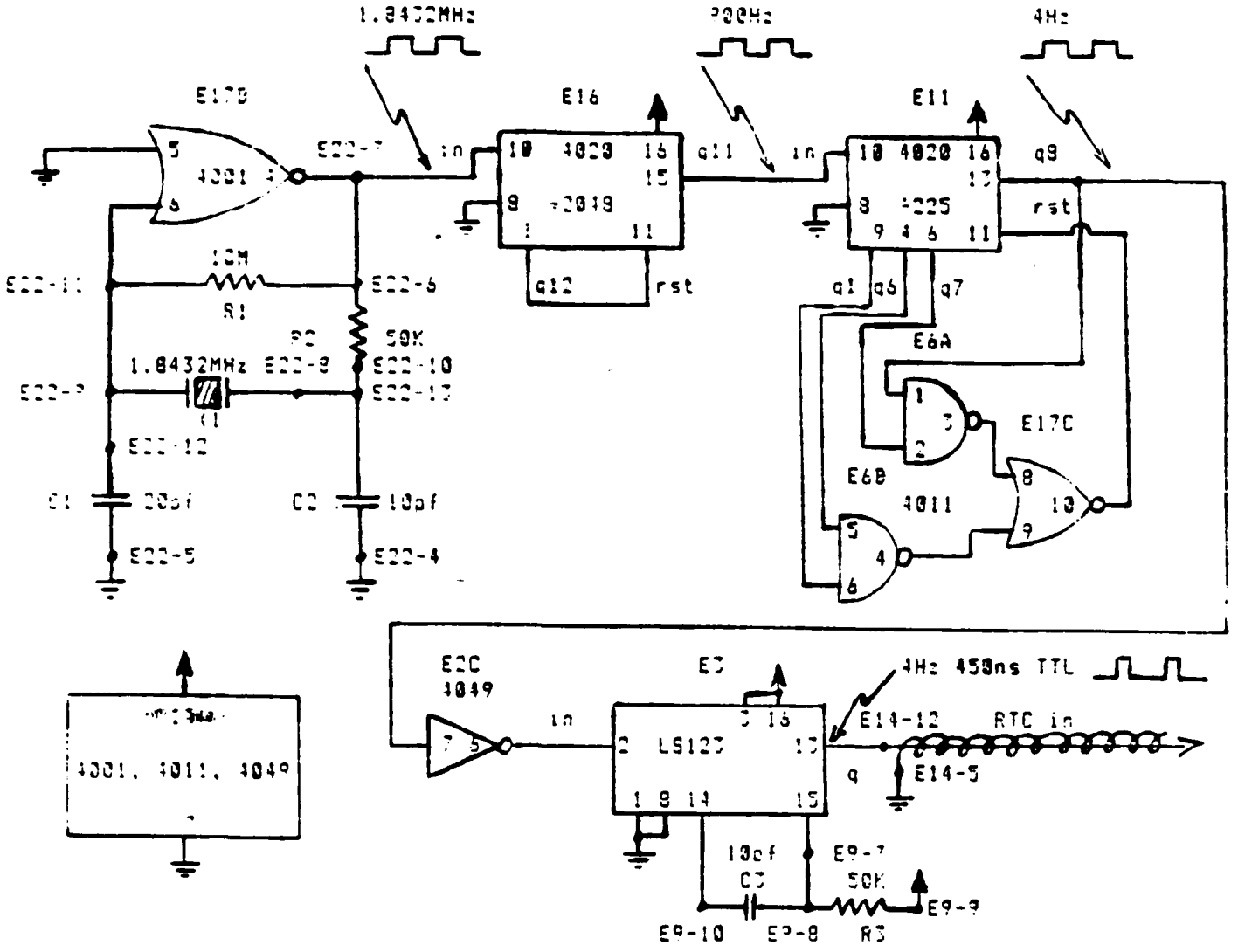
NOTES:
All 0.1 μf capacitors 16 V CER.
All resistors 1/4 W unless otherwise marked.
All TP on rear card edge
SW-1 = S P D T. toggle switch on card edge.
All adj resistors trimpots on rear card edge.
*10 μf = two 5 μf LALZ units (1.2" x .09" x .039" – L H T each)
**Values adjusted as needed to give required frequency cut-off.

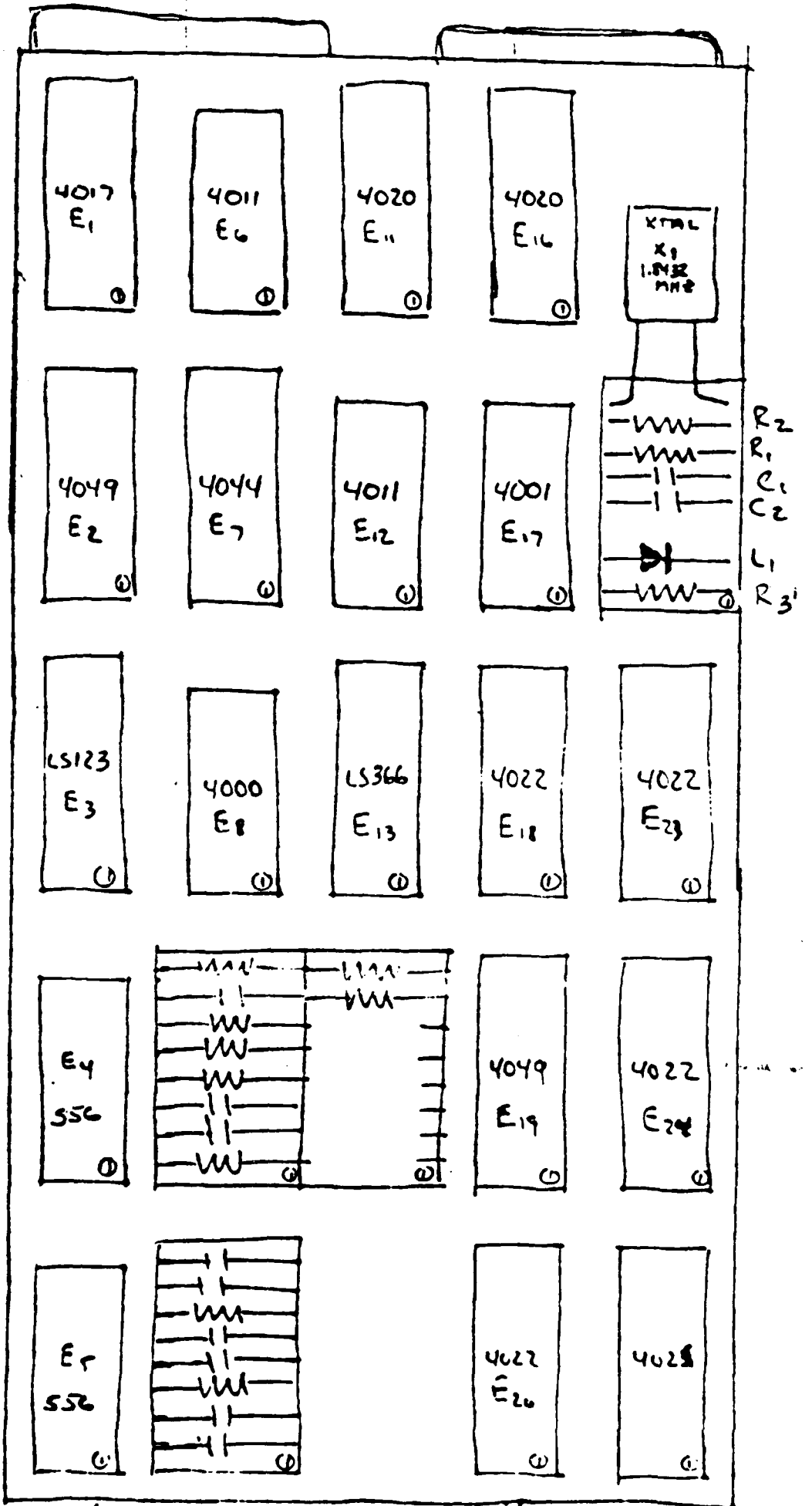
Send 4 SCB only
and 4 WBA

1-0-II

A/D TRIGGER BOARD

The W941 A/D trigger module is a 4Hz trigger for the A/D converter's RTC (real-time clock) input. A schematic is shown below, and the board layout is shown on the following page.




4017
E1
4011
E6
4020
E11
4020
E16
XTAL
X1
1.8432
MHz
4049
E2
4044
E7
4011
E12
4001
E17
R2
R1
C1
C2
L1
R3
LS123
E3
4000
E8
LS366
E13
4022
E18
4022
E23
E4
556
4049
E19
4022
E24
E5
556
4022
E20
4022

ADDITIONAL INFORMATION

Listed below is an inventory of the additional literature on site that has been supplied by the Geophysical Institute for this system.

Digital Equipment Corporation Hardware:
- Systems Service Manuals (2 volumes)
- PDP-11/03-L Field Prints
- DLV11-J Field Prints
- 11V03-L Field Prints
- MSV11-D User's Manual
- BA11-N Mounting Box User's Manual

Other Hardware:
- Dilog DQ120 Tape Controller Instruction Manual
- Dilog DQ120 Tape Controller Software Aids & Diagnostics
- Data Translation DT2762 A/D Converter User Manual
- Digital Pathways TCU-50 DYR Timing Control Unit User's Manual
- Data Systems Design DSD-430 Disk Drive & Controller Manual
- Epson MX-80 Printer Manual
- Comrex Gold Eagle Serial Interface (for printer) User Manual
- Lear Siegler ADM-5 Terminal User's Reference Manual

RT-11 Operating System (version 4 manuals):
- Installation Manual
- Intro to RT-11
- System User's Guide (2 volumes)
- System Message Manual
- Programmer's Reference Manual
- Software Support Manual
- RT-11 Pocket Guide

Windless Bight, Antarctica Infrasonic Array Documentation:
- Infrasonics Owner's Manual
- Infrasonics Software

Software (on flexible diskettes):
- 2ea. RT-11 (version 3) Operating System
- 2ea. Offline Analysis Programs
- 2ea. Data Retrieval Programs
- 2ea. TCK8CH Revision 22 Software (November 1983)
- 1ea. TCK8CH Revision 21 Software (July 1933)
- 3ea. Blank diskettes

Software (on magnetic tapes):
- 2ea. TCK8CH Revision 22 (executable) Data Acquisition Program

TCK8CH

This is the mainline data collection program, developed by Dave Spell. The development process is described in Digital Acquisition and Analysis System for Antarctica (GIR80-3) and Digital Data Acquisition and Analysis (Dave's thesis). This program is designed to run without an operating system, and must, therefore, be linked, loaded, and bootstrapped in a different manner from the programs normally run under RT-11. The procedure for linking the program and creating a program load tape may be found immediately following the program listing. This program, as well as the source files for all of the subroutines in TCKLIB and MACLIB may be found on disks labeled TCK8CH Rev22.

The procedure for bootstrapping the TCK8CH system is as follows:

1) Mount the program tape.

2) Restart the computer. The computer will respond with:

```
28
Start?
```

3) Reply: n

The computer will respond with: @

4) Enter: 1000/

The computer will respond with the contents of that memory location.

5) Enter the following, terminating each line with a line feed.

```
12700
172524
5310
12740
60011
105710
100376
5710
100767
12710
60003
105710
100376
5710
100777
5007
```

After each line feed, the computer will respond with the next address and its contents.

6) Enter: 1000G

The computer should read the program tape and respond with:

```
PAUSE -- MOUNT NEW TAPE
```

The TCK8CH program is now loaded, and ready to operate.

```
      C************  TCK8CH.FOR  ********************************************
      C
      C     Date of this revision: 19-Nov-83
      C
0001        PROGRAM TCK8CH
      C
      C     COMMON/array/DATA area
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        COMMON /IARRAY/ IA2DBK(2730),IBKRDY,ICHNL(8)
0004        COMMON /PASBLK/ IWKHDR(20),IFCHNL(512,4),ITCHNL(512,4)
0005        COMMON /APARAM/ FXDIF(6),FYDIF(6),FTDIF(6),FSIGMA(4),TXDIF(6),
           (TYDIF(6),TTDIF(6),TSIGMA(4)
0006        COMMON /ANALYS/ FFSPQX,FRHOVG,FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FTSPQX,TRHOVG,TVELOC,
           (TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),TPSI(4),TRHO(6),ITMAX(4),
           (ITMIN(4)
0007        DIMENSION JTAIL(98),ITAIL(150)
0008        EQUIVALENCE (FFSPQX,JTAIL(1)),(ITAIL(1),IA2DBK(2581))
0009        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLGT(6),FDIFA(6),TDIFA(6)
      C
0010        DATA ICHNL/0,1,2,3,4,5,6,7/,ITWEAK/1/,ARRNBR/1HB/
0011        DATA INBUFF/"177562/,IMASK/"177/,IADCSR/"177000/
0012        DATA IGETDT/-1/,IINTDT/0/,FOUR/1HF/,THREE/1HT/,BOTH/1HB/
0013        DATA XNO/1HN/,YES/1HY/,INO/-1/,IYES/1 /,PIOVRN/.0122719/
0014        DATA IRSTRT/1HR/,ITWEAK/1/
0015        DATA IUNIT/00/,IDNSTY/800/,IPARTY/1/
      C.....................................................................
      C
      C     Program and mag tape initialization area.
      C
0016   999  CALL REWTAP(IUNIT,ISTATU)
      C
0017   998  PAUSE ' MOUNT tape!!'
0018        TYPE 10
      C
0019   102  CALL MTINIT(IUNIT)
0020        IF (ISTATU(1) .NE. IYES) STOP
0022        CALLER = BOTH
0023        CALL CHLMIX(8)
      C
0024        DO 105,I = 1,150
0025   105  ITAIL(I) = 0
      C
0026        DO 110,I = 1,1536
0027   110  ITMPRY(I) = 0
      C
0028        RINDX = 0.
0029        DO 119,I = 1,129
0030        THETAN = COS(PIOVRN*RINDX)
0031        ITRGRY(I) = IFIX(32767.*THETAN + .5)
0032   119  RINDX = RINDX + 1.
```

```
      C
0033   109  TYPE 193
0034        ACCEPT 14,JYEAR
0035   112  JFLAG = IGETDT
0036        CALL TCKCLK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0037   108  TYPE 194,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0038        ACCEPT 12,ANSWER
0039        IF (ANSWER .NE. XNO) GO TO 107
0041        TYPE 195
0042        ACCEPT 196,JYEAR,JFLAG,JDAY,JHOUR,JMIN
0043        CALL TCKCLK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0044        GO TO 112
      C
0045   107  TYPE 19
0046        ACCEPT 12,ANSWER
0047        IF (ANSWER .NE. YES) GO TO 300
      C
0049        TYPE 13
0050        ACCEPT 12,ARRNBR
0051        IF (ARRNBR .EQ. THREE) GO TO 103
      C
0053        TYPE 15,FOUR
0054        ACCEPT 14,IFCNBR
0055        IF (IFCNBR .EQ. 4) GO TO 104
0057   114  TYPE 18
0058        ACCEPT 14,IFCHLM
0059        CALLER = FOUR
0060        CALL CHLMIX(IFCHLM)
0061   104  IF (ARRNBR .EQ. FOUR) GO TO 101
      C
0063   103  TYPE 15,THREE
0064        ACCEPT 14,ITCNBR
0065        IF (ITCNBR .EQ. 4) GO TO 101
0067   113  TYPE 181
0068        ACCEPT 14,ITCHLM
0069        CALLER = THREE
0070        CALL CHLMIX(ITCHLM)
      C
0071   101  TYPE 16
0072        ACCEPT 196, ICHNL
0073        TYPE 196,ICHNL
0074        GO TO 107
      C.....................................................................
      C
      C     Main program
      C
0075   300  IBKRDY = INO
0076        IA2DBK(2) = 0
0077        CALL A2DTCK(IA2DBK,IBkRDY,ISTATU,ICHNL)
      C
0078   303  IPROBE = IPEEK(INBUFF)
0079        IPROBE = (IPROBE .AND. IMASK)
0080        IPROBE = IPROBE + 8192
0081        IF (IPROBE .EQ. IRSTRT) GO TO 306
```

```
0083          IF (IBKRDY .NE. IYES) GO TO 303
      C
      C       A data block is filled!
      C
0085          CALL UNWIND (IA2DBK,IWKHDR,ITMPRY)
0086          CALL INIA2D
0087          GO TO 600
      C
0088    306   CALL IPOKE(IADCSR,0)
0089          DO 307,I = 1,2
0090          CALL EOFTAP(IUNIT,ISTATU)
0091          IF (ISTATU(1) .EQ. IND) CALL MTSTAT(IUNIT)
0093    307   CONTINUE
0094          GO TO 999
      C.....................................................................
      C
      C       Analysis area
      C
      C
0095    600   IIBKNR = IWKHDR(2)
0096          JMONDA = IWKHDR(3)
0097          JHRMIN = IWKHDR(4)
0098          JSEC = IWKHDR(5)
0099          IERRTO = IWKHDR(17)
0100          ISKWER = IWKHDR(18)
0101          IOVRNG = IWKHDR(19)
0102          IUNDRN = IWKHDR(20)
      C
0103          JFLAG = IINTDT
0104          JDAY = JMONDA
0105          JHOUR = JHRMIN
0106          CALL TCKCLK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0107          TYPE 197,IIBKNR,IERRTO,ISKWER,IOVRNG,IUNDRN
0108          TYPE 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
      C
0109          IF (ARRNBR .EQ. FOUR) GO TO 603
0111          FTSPQX = 0.
0112          CALLER = THREE
0113          CALL TCKTDA
0114          DO 608,I = 54,98
0115    608   ITAIL(4+I) = JTAIL(I)
      C
0116          IF (ITSTAT .LT. 0) GO TO 605
0118          CALL FILTER
0119          IF (FTSPQX .GT. 0.) GO TO 606
0121          TYPE 192,CALLER
0122          GO TO 605
      C
0123    606   CALL TCKTDA
0124          DO 607,I = 50,51
0125    607   ITAIL(53+I) = JTAIL(I)
      C
      C
0126    605   IF (ARRNBR .EQ. THREE) GO TO 609
```

```
      C.....................................................................
      C
0128   603  TYPE 191
0129        FFSPQX = 0.
0130        CALLER = FOUR
0131        CALL TCKTDA
0132        DO 604,I = 1,45
0133   604  ITAIL(I) = JTAIL(4+I)
      C
0134        IF (IFSTAT .LT. 0) GO TO 609
0136        CALL FILTER
0137        IF (FFSPQX .GT. 0.) GO TO 602
0139        TYPE 192,CALLER
0140        GO TO 609
      C
0141   602  CALL TCKTDA
0142        DO 601,I = 1,12
0143   601  ITAIL(45+I) = JTAIL(I)
      C
0144   609  IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0146        IBKRDY = INO
0147        GO TO 303
      C.....................................................................
      C
      C     FORMATs area
      C
      C
0148    10  FORMAT (/,' TCK8CH Rev 22.',$)
0149    12  FORMAT (A1)
0150    13  FORMAT (' F,T or B? '$)
0151    14  FORMAT (3I2)
0152    15  FORMAT (' ',A1,' array: 3 or 4? ',$)
0153    16  FORMAT (' A2D channels (missing channel in 4th position): ',$)
0154    18  FORMAT (' Missing channel  0,1,2,3 (or 9 if none)): ',$)
0155   181  FORMAT (' Missing channel  4,5,6,7 (or 8 if none)): ',$)
0156    19  FORMAT (' Changes?',$)
0157   191  FORMAT (' ',$)
0158   192  FORMAT ( ' ',A1,3X,'***INVALID FILTER!!***',$)
0159   193  FORMAT (' Year? ',$)
0160   194  FORMAT (' Time:',I3,'-',A3,'-',I2,I4,':',I2,' ',I2,'"Z?? ',$)
0161   195  FORMAT (' Correct time? (Y,M,D,H,M)  ',$)
0162   196  FORMAT (8I3)
0163   197  FORMAT (/,' #',5I6,$)
0164   198  FORMAT (' @TCK',I3,'-',A3,'-',I2,I4,':',I2,' ',I2,'"Z.',$)
0165   199  FORMAT (' ',A1,6F7.1,' Correct? :',$)
      C.....................................................................
      C
0166   500  STOP
0167        END
```

This is the procedure for revising the TCK8CH program and creating a load tape.

To revise a FORTRAN subroutine:

```
.EDIT filename.FOR
        <edit the source file as necessary>

.FORTRAN filename

.LIBRARY TCKLIB filename/REPLACE
```

To revise a MACRO subroutine:

```
.EDIT filename.MAC
        <edit the source file as necessary>

.MACRO filename

.LIBRARY MACLIB filename/REPLACE
```

To revise main program:

```
.EDIT TCK8CH.FOR
        <edit the source file as necessary>

.FORTRAN TCK8CH
```

Then carry out the following steps for any revision:

```
.R LINK
*TCK8CH,TCK8CH=TCK8CH,TCKLIB,MACLIB/F/L/I
Library search? $SIMRT
Library search? <CR>
* <CTRL C>
```

Mount the program tape (with a write enable ring inserted)

```
.INIT/FILE:SY:MBOOT.BOT MT0:

MT0:/Init are you sure?Y

.R PIP
*MT0:*.*=SY:MBOOTP.PRI,MBOOTS.SEC
*MT0:*.*=TCK8CH.LDA
* <CTRL C>

.DIR MT0:
        (the directory will show three files:  MBOOTP,MBOOTS, and TCK8CH)
```

```
RT-11 LINK  V05.04A     Load Map        Sat 19-Nov-83 00:00:00
TCK8CH.LDA      Title:  TCK8CH  Ident:  FORV02

Section  Addr    Size    Global  Value   Global  Value   Global  Value

. ABS.   000000  001000    (RW,I,GBL,ABS,OVR)
                          $USRSW  000000  $RF2A1  000000  .VIR    000000
                          $NLCHN  000006  $HRDWR  000006  $SYSV$  000011
                          $WASIZ  000152  $LRECL  000210
OTS$I    001000  017660    (RW,I,LCL,REL,CON)
                          $$OTSI  001000  $ERRTB  001000  $SHORT  001000
                          $ERRS   001105  ATAN2   001426  ATAN    001620
                          $CVTFB  002304  $CVTFI  002304  $CVTCB  002320
                          $CVTCI  002320  $CVTDB  002320  $CVTDI  002320
                          CIC$    002332  CID$    002332  CLC$    002332
                          CLD$    002332  $DI     002332  CIF$    002342
                          CLF$    002342  $RI     002342  CIL$    002450
                          CLI$    002454  $CVTIF  002456  $CVTIC  002472
                          $CVTID  002472  CCI$    002504  CDI$    002504
                          $IC     002504  $ID     002504  CFI$    002520
                          $IR     002520  RCI$    002604  GCO$    003620
                          FCO$    003626  ECO$    003632  DCO$    003640
                          $OTI    004610  $$OTI   004612  $$SET   006472
                          COS     006766  SIN     007022  SQRT    007360
                          $XFI    007510  XFI$    007522  $PWRI   007522
                          ABS     010000  OCI$    010016  ICI$    010024
                          $ECI    010040  OCO$    010220  ICO$    010226
                          $CHKER  010424  $IOEXI  010450  $EOL    010476
                          EOL$    010500  IFR$    010614  $IFR    010620
                          $$IFR   010624  IFR$$   010656  IFW$    010700
                          $IFW    010704  $$IFW   010710  IFW$$   010746
                          IDINT   011016  INT     011016  $SIMRT  011232
                          $TKS    012062  $TKB    012064  $TPS    012066
                          $TPB    012070  AINT    012126  $INTR   012144
                          ADF$IS  012230  $ADDF   012236  ADF$SS  012250
                          $ADR    012250  ADF$PS  012254  ADF$MS  012260
                          SUF$IS  012274  $SUBF   012302  SUF$SS  012314
                          $SBR    012314  SUF$PS  012320  SUF$MS  012324
                          DIF$PS  012340  DIF$MS  012344  DIF$IS  012356
                          $DIVF   012364  DIF$SS  012376  $DVR    012376
                          MUF$PS  012402  MUF$MS  012406  MUF$IS  012420
                          $MULF   012426  MUF$SS  012440  $MLR    012440
                          $CLOSE  012444  $FCHNL  014110  $FIO    014744
                          $$FIO   014750  $INITI  016100  $PSE    016212
                          $PSES   016246  BAH$    016276  PSE$    016312
                          $POPR4  016356  $POPR5  016356  $POPR3  016370
                          $FUTRE  016376  $PUTBL  016704  $GETBL  017114
                          $EOFIL  017300  $EOF2   017314  SAVRG$  017334
                          THRD$   017512  $STPS   017514  STP$    017522
                          $STP    017522  FOO$    017526  $EXIT   017546
                          $OTIS   017672  $$OTIS  017674  TAI$    020014
                          $TAI    020014  TAL$    020022  $TAL    020022
                          TAQ$    020030  $TAQ    020030  TAP$    020036
                          $TAP    020036  TAD$    020044  $TAD    020044
                          TAF$    020052  $TAF    020052  TVL$    020274
                          $TVL    020274  TVF$    020302  $TVF    020302
                          TVD$    020310  $TVD    020310  TVQ$    020316
```

```
                                $TVQ    020316  TVP$    020324  $TVP    020324
                                TVI$    020332  $TVI    020332  $WAIT   020466
                                $VRINT  020530  $DUMPL  020532
OTS$P   020660  000050          (RW,D,GBL,REL,OVR)
SYS$I   020730  000020          (RW,I,LCL,REL,CON)
                                IPEEK   020730  IPOKE   020740
USER$I  020750  000000          (RW,I,LCL,REL,CON)
$CODE   020750  030142          (RW,I,LCL,REL,CON)
                                $$OTSC  020750  MTINIT  025312  MTSTAT  027240
                                CHLMIX  030260  FILTER  031630  TCKTDA  033760
                                BEMEST  041524  PURFIL  045364  SMOOTH  050334
OTS$O   051112  001040          (RW,I,LCL,REL,CON)
                                $$OTSO  051112  $OPEN   051112
SYS$O   052152  000000          (RW,I,LCL,REL,CON)
$DATAP  052152  004172          (RW,D,LCL,REL,CON)
OTS$D   056344  000006          (RW,D,LCL,REL,CON)
OTS$S   056352  000304          (RW,D,LCL,REL,CON)
                                $AOTS   056352
SYS$S   056656  000004          (RW,D,LCL,REL,CON)
                                $SYSLB  056656  $LOCK   056660  $CRASH  056661
$DATA   056662  001516          (RW,D,LCL,REL,CON)
USER$D  060400  000000          (RW,D,LCL,REL,CON)
.$$$$.  060400  000000          (RW,D,GBL,REL,OVR)
MTBLK   060400  000034          (RW,D,GBL,REL,OVR)
IARRAY  060434  012546          (RW,D,GBL,REL,OVR)
PASBLK  073202  020050          (RW,D,GBL,REL,OVR)
APARAM  113252  000260          (RW,D,GBL,REL,OVR)
ANALYS  113532  000304          (RW,D,GBL,REL,OVR)
MISC    114036  016534          (RW,D,GBL,REL,OVR)
WRKSPC  132572  010000          (RW,D,GBL,REL,OVR)
        142572  000210          (RW,I,LCL,REL,CON)
                                $GETRE  142572  $TTYIN  142646
TAPEIO  143002  002622          (RW,I,GBL,REL,OVR)
                                INITAP  143176  STATAP  143476  SPCTAP  144116
                                REWTAP  144316  EOFTAP  144456  WRITAP  144626
                                REDTAP  145176
FFT512  145624  001334          (RW,I,GBL,REL,CON)
                                FFT512  145672
MAXMIN  147160  000074          (RW,I,GBL,REL,CON)
                                MAXMIN  147160
MUNPSI  147254  000144          (RW,I,GBL,REL,CON)
                                MUNPSI  147254
RTXCOV  147420  000314          (RW,I,GBL,REL,CON)
                                RTXCOV  147424
UNWIND  147734  000266          (RW,I,GBL,REL,CON)
                                UNWIND  147736
TCKCLK  150222  001076          (RW,I,GBL,REL,CON)
                                TCKCLK  150222
A2DTCK  151320  001654          (RW,I,GBL,REL,CON)
                                A2DTCK  151410  INIA2D  151604
FLTIX4  153174  000150          (RW,I,GBL,REL,CON)
                                FLTIX4  153176
$STACK  153344  000200          (RW,D,LCL,REL,CON)
$STKST  153544  000000          (RW,D,LCL,REL,CON)
                                $$$STK  153544

Transfer address = 020750, High limit = 153544 = 27570. words
```

FORTRAN SUBROUTINES

RT-11 LIBRARIAN V03.05 MON 30-JAN-84 00:00:00
TCKLIB SAT 19-NOV-83 00:00:00

MODULE	GLOBALS	GLOBALS	GLOBALS
MTCONT	MTINIT		
+	MTSTAT		
	BEMEST		
	PURFIL		
	SMOOTH		
	CHLMIX		
	FILTER		
	TCKTDA		

```
      C*************************************************************************
      C
      C     The date of this revision is 26-Nov-80.
      C.........................................................................
      C
0001          SUBROUTINE MTINIT(IUNIT)
      C
      C   COMMON/DATA/CONSTANTS AREA
      C
0002          COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003          DATA INO/-1/,IYES/1/,XNO/1HN/,YES/1HY/
      C
      C.....tape recorder initialization SUBROUTINE.....................
      C
0004   200    CALL INITAP (IUNIT,IDNSTY,IPARTY,ISTATU)
0005          IF (ISTATU(1) .EQ. INO) GO TO 201
0007          IF (ISTATU(2) .EQ. INO) GO TO 202
0009          TYPE 23
0010   204    IF (ISTATU(4) .EQ. INO) GO TO 206
0012          TYPE 24
0013          IF (ISTATU(6) .EQ. IYES) GO TO 208
0015   214    TYPE 28
0016          ACCEPT 292, ANSWER
0017          IF (ANSWER .EQ. XNO) GO TO 210
0019          IF (ANSWER .EQ. YES) GO TO 205
0021          TYPE 291
0022          GO TO 214
0023   210    TYPE 280
0024          ACCEPT 292, ANSWER
0025          IF (ANSWER .EQ. XNO) GO TO 211
0027          IF (ANSWER .EQ. YES) GO TO 209
0029          TYPE 291
0030          GO TO 210
      C
      C  Alternate TRAPs area
      C
0031   201    TYPE 20
0032          GO TO 205
      C
0033   202    IF (ISTATU(3) .EQ. IYES) GO TO 203
0035          TYPE 21
0036          GO TO 205
      C
0037   203    TYPE 22
0038          GO TO 204
      C
0039   205    PAUSE ' INITAP failed to initialize!  <CR>'
0040          GO TO 200
      C
0041   206    TYPE 25
0042          IF (ISTATU(5) .EQ. IYES) GO TO 207
0044          GO TO 205
      C
0045   207    TYPE 26
```

```
0046          GO TO 205
      C
0047    208   TYPE 27
0048          ACCEPT 292, ANSWER
0049          IF (ANSWER .EQ. XNO) GO TO 211
0051          IF (ANSWER .EQ. YES) GO TO 205
0053          TYPE 291
0054          GO TO 208
      C
0055    209   CALL EOFTAP (IUNIT,ISTATU)
0056          IF (ISTATU(1) .EQ. INO) GO TO 213
0058    212   TYPE 281
0059          ACCEPT 292, ANSWER
0060          IF (ANSWER .EQ. XNO) GO TO 211
0062          IF (ANSWER .EQ. YES) GO TO 209
0064          TYPE 291
0065          GO TO 212
      C
0066    211   RETURN
      C
0067    213   TYPE 29
0068          CALL MTSTAT(IUNIT)
0069          RETURN
      C
      C FORMATs area
      C
0070     20   FORMAT (' ERROR on INITAP return (CALL arguments)!',$)
0071     21   FORMAT (' Tape unit is NOT ON LINE!',$)
0072     22   FORMAT (' Tape unit is ON LINE but tape is NOT at BOT!',$)
0073     23   FORMAT (' Tape unit is ON LINE and tape is at BOT!',$)
0074     24   FORMAT (' Tape unit is ready!',$)
0075     25   FORMAT (' Tape unit is NOT ready!',$)
0076     26   FORMAT (' Tape is rewinding (or loading forward)!',$)
0077     27   FORMAT (' Tape is WRITE PROTECTED (ring is OUT)-do you want to rei
             $nitialize ? <Y or N> ',$)
0078    280   FORMAT (' Do you want an immediate EOF (end of file) to precede th
             $e data?  <Y or N> ',$)
0079     28   FORMAT (' Tape is NOT write protected (ring is IN)-do you want to
             $reinitialize? <Y or N> ',$)
0080    281   FORMAT (' Do you want another EOF on this tape? <Y or N> ',$)
0081     29   FORMAT (' ERROR on EOFTAP return!',$)
0082    291   FORMAT (' WRONG answer!')
0083    292   FORMAT (A1)
0084          END
```

```
0001          SUBROUTINE MTSTAT(IUNIT)
      C
      C   COMMON/DATA/CONSTANTS AREA
      C
0002          COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003          DATA INO/-1/,IYES/1/,XNO/1HN/,YES/1HY/
      C
      C.....error status determination SUBROUTINE.....
      C
0004   600    CALL STATAP (IUNIT,ISTATU)
0005          IF (ISTATU(8) .EQ. IYES) GO TO 608
0007          IF (ISTATU(1) .EQ. IYES) GO TO 601
0009          IF (ISTATU(2) .EQ. INO) GO TO 609
0011          TYPE 63
0012   609    IF (ISTATU(3) .EQ. INO) GO TO 610
0014          TYPE 661
0015   610    IF (ISTATU(4) .EQ. INO) GO TO 604
0017          TYPE 662
0018   604    IF (ISTATU(6) .EQ. INO) GO TO 605
0020          TYPE 64
0021   605    IF (ISTATU(7) .EQ. INO) GO TO 606
0023          TYPE 65
0024   606    IF (ISTATU(5) .EQ. INO) GO TO 607
0026          TYPE 68
0027   607    TYPE 69, (ISTATU(K), K=9,12)
0028          RETURN
      C
      C Alternate TRAPs area
      C
0029   601    ISTATU(1) = INO
0030          TYPE 60
0031          TYPE 67, ISTATU(2)
0032          IF (ISTATU(3) .EQ. INO) GO TO 602
0034          IF (ISTATU(4) .EQ. INO) GO TO 603
0036          RETURN
      C
0037   602    TYPE 61
0038          RETURN
      C
0039   603    TYPE 62
0040          RETURN
      C
0041   608    TYPE 663
0042          ISTATU(1) = IYES
0043          RETURN
      C
      C FORMATs area
      C
0044     60   FORMAT (' ILLC bit set: ILLEGAL command-here is why:',$)
0045     61   FORMAT (' SELR = INO: tape unit is NOT ON LINE!',$)
0046     62   FORMAT (' CURD = INO: control unit is NOT ready!',$)
0047     63   FORMAT (' NXM bit set: no memory response!',$)
0048     64   FORMAT (' BGL bit set: BUS too slow responding!',$)
0049     65   FORMAT (' PAE bit set: UNABLE to recover parity error!',$)
```

```
0050     67  FORMAT (' MTC = ',I6,': (convert INTEGER*2 to OCTAL)!',$)
0051     68  FORMAT (' EOT bit set: end of tape encountered!',$)
0052     69  FORMAT (' The following values are given to aid in trouble analysi
            $s,',/,' (convert INTEGER*2 to OCTAL):',/,'   MTS = ',I6,/,'   MTC
            $= ',I6,/,' MTBRC = ',I6,/,' MTCMA = ',I6)
0053    661  FORMAT (' BTE bit set: character during gap shut down!',$)
0054    662  FORMAT (' RLE bit set: tape record is longer than specified!',$)
0055    663  FORMAT (' EOF (end-of-file) encountered!',$)
0056         END
```

```
      C************** BEMEST.FOR ****************************************
      C
      C     Date of this revision: 2-Jul-83
      C
      C     A system optimized version of a least-squares procedure for
      C     the direct estimation of azimuth and velocity of a propagating
      C     wave.  (Flinn & McCowan, 1970)
      C
0001        SUBROUTINE BEMEST
      C
      C    -XDIF,-YDIV,-TDIF are differences between pairs of an array.
      C     The F or T preceeding the above are the SP element and LP element
      C     array indicators.  The differences are ordered 1-2,1-3,1-4,2-3,
      C    2-4,3-4 on the arrays.  n.b. If either array has only three
      C     active elements, the differences must be reordered 1-2,1-3,2-3.
      C
      C     COMMON/array/DATA area
      C
0002        COMMON /APARAM/ FXDIF(6),FYDIF(6),FTDIF(6),FSIGMA(4),TXDIF(6),
           (TYDIF(6),TTDIF(6),TSIGMA(4)
0003        COMMON /ANALYS/ FFSPQX,FRHOVG,FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FTSPQX,TRHOVG,TVELOC,
           (TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),TPSI(4),TRHO(6),ITMAX(4),
           (ITMIN(4)
0004        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLGT(6),FDIFA(6),TDIFA(6)
0005        COMMON /WRKSPC/ XDIF(6),YDIF(6),TDIF(6),THETA,DENOM,XBYX,YBYY,
           (TBYT,XBYY,XBYT,YBYT,DET,F1,F2,VELOC,AZIMF,F1F1,F2F2,F1F2,VEVAR,
           (AZVAR,V2,V4,FBY1,FBY2,FBY3,FBY4,FBY5,TERRSQ,XONE
      C
0006        DATA RADDEG/57.29578/,THREE/1HT/,INO/-1/,IYES/1/
      C.............routine area.....................................
      C
      C     Compute the generalized inverse matrix of station separations.
      C     This requires the "left-inverse" of the non-symmetric matrix
      C     [H], given by: (1/[H]'[H])[H]' where [H]' is the conjugate
      C     transpose of [H].
      C
0007        ISTAT = IYES
0008     10 IF (CALLER .EQ. THREE) GO TO 12
      C
0010        DO 11,I = 1,INRDIF
0011        XDIF(I) = FXDIF(I)
0012        YDIF(I) = FYDIF(I)
0013     11 TDIF(I) = FTDIF(I)
0014        GO TO 13
      C
0015     12 DO 14,I = 1,INRDIF
0016        XDIF(I) = TXDIF(I)
0017        YDIF(I) = TYDIF(I)
0018     14 TDIF(I) = TTDIF(I)
      C
0019     13 XBYX = 0.
```

```
0020          YBYY = 0.
0021          TBYT = 0.
0022          XBYY = 0.
0023          XBYT = 0.
0024          YBYT = 0.
0025          DO 15,I = 1,INRDIF
0026          XBYX = XBYX + XDIF(I)**2
0027          YBYY = YBYY + YDIF(I)**2
0028          TBYT = TBYT + TDIF(I)**2
0029          XBYY = XBYY + XDIF(I)*YDIF(I)
0030          XBYT = XBYT + XDIF(I)*TDIF(I)
0031       15 YBYT = YBYT + YDIF(I)*TDIF(I)
      C.....................................................
      C
      C     Find azimuth (degrees) and velocity (meters/second).
      C
0032          DET = 1./(XBYX*YBYY - XBYY**2)
0033          F1 = (YBYY*XBYT - XBYY*YBYT)*DET
0034          F2 = (XBYX*YBYT - XBYY*XBYT)*DET
0035          THETA = ATAN2(F1,F2)
0036          DENOM = SQRT(F1**2 + F2**2)
0037          IF (DENOM .NE. 0.) GO TO 20
0039          ISTAT = INO
0040          RETURN
      C
0041       20 VELOC = 1./DENOM
0042          IF (VELOC .LT. 200.) ISTAT = 0
0044          IF (VELOC .GT. 700.) ISTAT = 0
0046          AZIMF = THETA*RADDEG
0047          IF (AZIMF .LT. 0.) AZIMF = AZIMF + 360.
      C
0049          F1F1 = F1*F1
0050          F1F2 = F1*F2
0051          F2F2 = F2*F2
0052          V2 = VELOC**2
0053          V4 = VELOC**4
0054          FBY1 = F1F1*XBYX
0055          FBY2 = F2F2*YBYY
0056          FBY3 = -F1F2*XBYY
0057          FBY4 = F1F1*YBYY
0058          FBY5 = F2F2*XBYX
0059          TERRSQ = ABS(TBYT - FBY1 - FBY2 + 2*FBY3)
0060          XONE = TERRSQ*V4*DET
      C
0061          VEVAR = SQRT(V2*XONE*(FBY4 + FBY5 + 2*FBY3))
0062          AZVAR = SQRT(XONE*(FBY2 + FBY1 - 2*FBY3))*RADDEG
      C
0063          IF (INRDIF .EQ. 3) GO TO 22
0065          VEVAR = .25*VEVAR
0066          AZVAR = .25*AZVAR
      C
0067       22 IF (CALLER .EQ. THREE) GO TO 21
0069          FVELOC = VELOC
0070          FAZIMF = AZIMF
```

```
0071          FVEVAR = VEVAR
0072          FAZVAR = AZVAR
0073          RETURN
          C
0074       21 TVELOC = VELOC
0075          TAZIMF = AZIMF
0076          TVEVAR = VEVAR
0077          TAZVAR = AZVAR
0078          RETURN
          C
0079          END
```

```
      C************  PURFIL.FOR  ****************************************
      C
      C     Date of this revision: 31-Jan-83
      C
      C     P = [N*Tr(S**2) - Tr(S)**2]/[(N - 1)*Tr(S)**2]  where each Trace
      C     and cross-term series is appropriately conditioned, i.e. has a
      C    "running averager" (SMOOTH) applied three times.
      C
0001        SUBROUTINE PURFIL(FREARY)
      C
      C     COMMON/array area
      C
0002        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLGT(6),FDIFA(6),TDIFA(6)
0003        COMMON /WRKSPC/ DUMMY1(256),DUMMY2(256),TRACED(256),TRACEN(256)
0004        DIMENSION POLARZ(256),FREARY(256,4)
0005        EQUIVALENCE (POLARZ(1),DUMMY1(1))
      C.............routine area.....................................
      C
      C     Insure that DC terms are 0!
      C
0006    10  DO 11,I = 1,INRCHL
0007        FREARY(1,I) = 0.
0008    11  FIMGRY(1,I) = 0.
      C
0009        IN = INRCHL - 1
0010        F1COEF = 1./FLOAT(IN)
0011        F2COEF = F1COEF*FLOAT(INRCHL)
      C.....................................................................
      C
      C     Form trace terms of spectral matrices and determine position
      C    (frequency) of last (if more than one) maximum value.
      C
0012        DO 20,I = 1,256
0013        TRACED(I) = 0.
0014    20  TRACEN(I) = 0.
      C
0015        DO 21,I = 1,INRCHL
      C
0016        DO 22,J = 1,256
0017    22  DUMMY1(J) = FREARY(J,I)*F20        DO 21,K = 1,256
0021        TRACED(K) = TRACED(K) + DUMMY1(K)
0022    21  TRACEN(K) = TRACEN(K) + DUMMY1(K)*DUMMY1(K)
      C
0023        TRACEM = 0.
0024        ITRMAX = 0
0025        DO 24,I = 1,256
0026        IF (TRACED(I) .LT. TRACEM) GO TO 25
```

```
0028          TRACEM = TRACED(I)
0029          ITRMAX = I
0030       25 TRACET = TRACED(I) *TRACED(I)
0031          IF (TRACET .GT. 0.) GO TO 24
0033          ITRMAX = 0
0034          GO TO 50
0035       24 TRACED(I) = FACDEF/TRACET
      C.....................................................................
      C
      C     Form cross-terms of spectral matrices.
      C
0036          DO 30,I = 1,IN
0037          II = I + 1
      C
0038          DO 30,J = II,INRCHL
      C
0039          DO 32,K = 1,256
0040          DUMMY1(K) = FREARY(K,I)*FREARY(K,J) + FIMGRY(K,I)*FIMGRY(K
0041       32 DUMMY2(K) = FIMGRY(K,I)*FREARY(K,J) - FREARY(K,I)*FIMGRY(K
      C
0042          DO 33,N = 1,2
0043          CALL SMOOTH(DUMMY1)
0044       33 CALL SMOOTH(DUMMY2)
      C
0045          DO 30,K = 1,256
0046          DUMMY2(K) = DUMMY1(K)**2 + DUMMY2(K)**2
0047          TRACEN(K) = TRACEN(K) + 2.*DUMMY2(K)
0048       30 CONTINUE
      C.....................................................................
      C
      C     Compute degree of polarization (DOP) for each
      C
0049          POLAR1(1) = 0.
0050          DO 40,K = 1,256
0051          POLAR1(K) = TRACEN(K)*TRACEN(K)
0052       40 POLAR1(1) = POLAR1(1) + TRACEN(K)
      C
0053          DO 41,I = 1,INRCHL
      C
0054          DO 41,J = 1,256
0055          FREARY(J,I) = FREARY(J,I)*POLAR1(J)
0056       41 FIMGRY(J,I) = FIMGRY(J,I)*POLAR1(J)
      C
0057       50 RETURN
0058          END
```

```
      C************** SMOOTH.FOR ****************************************
      C
      C     Date of this revision: 1-Oct-82
      C
0001        SUBROUTINE SMOOTH VECTOR
      C
0002        DIMENSION VECTOR 256)
      C
0003        TEMP1 = 0.
0004        TEMP2 = .25*VECTOR(1  + .25*VECTOR 2)
0005        TEMP1 = .25*VECTOR 256  + .25*VECTOR(255)
0006        DO 99 I = 2,255
0007        II = I - 2
0008        IF  II  GT  0  VECTOR II  = TEMP1
0009        TEMP1 = TEMP2
0010        TEMP2 = .25*VECTOR I-1  + .5*VECTOR I  + .25*VECTOR I+1)
0011     99 TEMP2 = .25*TEMP2
0012        VECTOR 254  = TEMP1
0013        VECTOR 255  = TEMP2
0014        VECTOR 256  = TEMP1

0015        RETURN
0016        END
```

```
      C************** CHLMIX.FOR ***********************************************
      C
      C     Date of revision: 30-Jun-83
      C
0001        SUBROUTINE CHLMIX(ICHNLM)
      C
      C     PURPOSE
      C        To rearrange parameters in case of a missing channel
      C
      C     USAGE
      C        CALL CHLMIX(ICHNLM)
      C
      C     INPUT PARAMETERS
      C        ICHNLM - The missing channel number:
      C                    0,1,2, or 3 if F array
      C                    4,5,6, or 7 if T array
      C                    8 if none (to correct a previous entry)
      C
      C     REMARKS
      C        If during the run of a program, a three channel situation
      C        occurs, this routine will rearrange the analysis parameters
      C        accordingly.  If the system is then restored to four channels,
      C        this routine must be called (with ICHNLM = 8) to restore the
      C        original analysis parameters.
      C
0002        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLGT(6),FDIFA(6),TDIFA(6
0003        COMMON /APARAM/ FXDIF(6),FYDIF(6),FTDIF(6),FSIGMA(4),TXDIF(6),
           (TYDIF(6),TTDIF(6),TSIGMA(4)
0004        DIMENSION MIXUP(12),IXFLGF(6),IXFLGT(6),FDIFB(6),TDIFB(6)
0005        DIMENSION FXDIFA(6),FYDIFA(6),TXDIFA(6),TYDIFA(6)
0006        DATA MIXUP/4,5,6,2,3,6,1,3,5,1,2,4/,FOUR/1HF/,THREE/1HT/
0007        DATA IXFLGF/25,33,33,33,33,33/,FDIFB/12.,16.,11.,11.,16.,11./
0009        DATA IXFLGT/17,25,65,17,75,73/,TDIFB/2.0,3.0,8.0,2.0,9.25,9.0/
0009        DATA FXDIFA/1432.,3897.,2460.,2465.,1329.,-1437./
0010        DATA FYDIFA/2520.,1098.,-1372.,-1422.,-3892.,-2470./
0011        DATA TXDIFA/-362.,180.,1971.,462.,2334.,1871./
0012        DATA TYDIFA/-407.,-618.,524.,-211.,971.,1142./
      C
0013        IF (ICHNLM .GT. 7) GO TO 220
0015        IF (ICHNLM .GT. 3) ICHNLM = ICHNLM - 4
0017        INDEX = ICHNLM * 3
0018        DO 200 I = 1,3
0019        INDEX = INDEX + 1
0020        IPOINT = MIXUP(INDEX)
0021        IF (CALLER .EQ. THREE) GO TO 100
0023        IXFLGF(I) = IXFLGF(IPOINT)
0024        FDIFA(I) = FDIFB(IPOINT)
0025        FXDIF(I) = FXDIFA(IPOINT)
0026        FYDIF(I) = FYDIFA(IPOINT)
0027   100  IF (CALLER .EQ. FOUR) GO TO 200
0029        IXFLGT(I) = IXFLGT(IPOINT)
0030        TDIFA(I) = TDIFB(IPOINT)
```

```
0031          TXDIF(I) = TXDIFA(IPOINT)
0032          TYDIF(I) = TYDIFA(IPOINT)
0033    200   CONTINUE
0034          RETURN
0035    300   IF (CALLER .EQ. THREE) GO TO 400
0037          IFCNBR = 4
0038          DO 301 I = 1,6
0039          IXFLGF(I) = JXFLGF(I)
0040          FDIFA(I) = FDIFB(I)
0041          FXDIF(I) = FXDIFA(I)
0042    301   FYDIF(I) = FYDIFA(I)
0043    400   IF (CALLER .EQ. FOUR) RETURN
0045          ITCNBR = 4
0046          DO 401 I = 1,6
0047          IXFLGT(I) = JXFLGT(I)
0048          TDIFA(I) = TDIFB(I)
0049          TXDIF(I) = TXDIFA(I)
0050    401   TYDIF(I) = TYDIFA(I)
0051          RETURN
0052          END
```

```
      C************** FILTER.FOR ****************************************
      C
      C     Date of this revision: 18-Nov-83
      C
0001        SUBROUTINE FILTER
      C
      C     COMMON/array/DATA area
      C
0002        COMMON /PASBLK/ IWKHDR(20),I8CHNL(512,8)
0003        DIMENSION F8CHNL(256,8),IBOOST(4)
0004        EQUIVALENCE (F8CHNL(1,1),I8CHNL(1,1))
0005        COMMON /ANALYS/ FFSPQX,FRHOVG,FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FTSPQX,TRHOVG,TVELOC,
           (TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),TPSI(4),TRHO(6),ITMAX(4),
           (ITMIN(4)
0006        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLGT(6),FDIFA(6),TDIFA(6)
0007        COMMON /WRKSPC/ IWKSPC(2048)
      C
0008        DATA IFRWRD/1/,INVRSE/-1/,IYES/1/,INO/-1/,THREE/3/,FOUR/4/
      C.............routine area.....................................................
      C
0009        IF (CALLER .EQ. THREE) GO TO 34
      C
0011        INRCHL = IFCNBR
0012        DO 35,I = 1,INRCHL
0013        IBOOST(I) = IFMAX(I) - IFMIN(I)
0014        IF (IBOOST(I) .NE. 0) IBOOST(I) = 2048/IBOOST(I)
0016     35 IF (IBOOST(I) .EQ. 0) IBOOST(I) = 1
0018        FK = 1
0019        GO TO 38
      C
0020     34 INRCHL = ITCNBR
0021        DO 36,I = 1,INRCHL
0022        IBOOST(I) = ITMAX(I) - ITMIN(I)
0023        IF (IBOOST(I) .NE. 0) IBOOST(I) = 2048/IBOOST(I)
0025     36 IF (IBOOST(I) .EQ. 0) IBOOST(I) = 1
0027        FK = 5
      C
      C     Transform INRCHL channels of data into FLOAT area.
      C
0028     38 DO 31,I = 1,INRCHL
      C
0029        DO 33,M=1,512
0030     33 IWKSPC(M) = I8CHNL(M,FK)*IBOOST(I)
      C
0031        ISTATU = IFRWRD
0032        CALL FFT512(IWKSPC(1),IWKSPC(513),IWKSPC(1025),ITRGRY,ISTAT)
      C
0033        K = 513
0034        DO 32,J = 1,256
0035        F8CHNL(J,KK) = FLOAT(IWKSPC(J))
0036        FIMGRY(J,I) = FLOAT(IWKSPC(K))
```

```
  32  K = K + 1
C
  31  KK = KK + 1
C.........................................................................
C
      KK = KK - INRCHL
      CALL PURFIL(FBCHNL(1,KK))
C
C     INT filtered data, retransform them and put back into array.
C
      DO 50,I = 1,INRCHL
C
      L = 514
      LP = 1024
      JP = 512
      IWKSPC(1) = 0
      IWKSPC(513) = 0
      DO 51,J = 2,256
      IWKSPC(J) = INT(FBCHNL(J,KK))
      IWKSPC(JP) = IWKSPC(J)
      IWKSPC(L) = INT(FIMGRY(J,I))
      IWKSPC(LP) = -IWKSPC(L)
      L = L + 1
      LP = LP - 1
  51  JP = JP - 1
C
      IWKSPC(257) = 0
      IWKSPC(769) = 0
C
      ISTATU = INVRSE
      CALL FFT512(IWKSPC(1),IWKSPC(513),[illegible],ITRGRY,ISTATU)
C
      DO 52,L = 1,512
  52  FBCHNL(L,KK) = IWKSPC(L)
C
  50  [illegible]
C
      [illegible] = FLOAT([illegible])
      IF (CALLER .EQ. THREE) [illegible]
      IF (CALLER .EQ. [illegible]) [illegible]
C
      RETURN
      END
```

```
      C************  TCKTDA.FOR  ********************************************
      C
      C     Date of this revision: 19-Nov-83
      C
      C     A subroutine to do the Time Domain Analyses of TCK8CH data.
      C
0001        SUBROUTINE TCKTDA
      C
0002        COMMON /PASBLK/ IWKHDR(20),IFCHNL(512,4),ITCHNL(512,4)
0003        COMMON /APARAM/ FXDIF(6),FYDIF(6),FTDIF(6),FSIGMA(4),TXDIF(6),
           (TYDIF(6),TTDIF(6),TSIGMA(4)
0004        COMMON /ANALYS/ FFSPQX,FRHOVG,FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FTSPQX,TRHOVG,TVELOC,
           (TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),TPSI(4),TRHO(6),ITMAX(4),
           (ITMIN(4)
0005        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLST(6),FDIFA(6),TDIFA(6)
0006        COMMON /WRKSPC/ IWKSPC(1172),RHOARY(75),IEND,JEND,IDUM,TDIF,
           (RHOMAX,FDIF,FNRDIF,IXFLG
      C
0007        DATA IYES/1/,INO/-1/,THREE/1HT/,FOUR/1HF/
      C.....................routine area.....................................
      C
      C     Compute cross-correlations (normalized covariances) between
      C     all pairs of the arrays.
      C
0008        INRDIF = 6
0009        ISTAT = INO
0010        IF (CALLER .EQ. THREE) GO TO 59
      C
      C     Here's the four element (F) analysis.
      C
0012        IF (IFCNBR .EQ. 3) INRDIF = 3
0014        FNRDIF = FLOAT(INRDIF)
0015        DO 60,I = 1,IFCNBR
0016        CALL MAXMIN(IFCHNL(1,I),IFMAX(I),IFMIN(I))
0017        CALL MUNPSI(IFCHNL(1,I),FMU(I),FPSI(I))
0018        FSIGMA(I) = FPSI(I) - FMU(I)**2
0019        IF (FSIGMA(I) .LE. 0.) GO TO 62
0021        FSIGMA(I) = SQRT(FSIGMA(I))
0022        FPSI(I) = SQRT(FPSI(I))
0023        IAVG = INL(IZ,I) - IAVG
      C
0026        FRHOVG = 0.
0027        IEND = IFCNBR - 1
0029        JEND = IFCNBR
0029        K = 1
0030        DO 61,I = 1,IEND
0031        K = I + 1
      C
0032        DO 61,J = K,JEND
```

```
0033          IXFLG = IXFLGF(M)
0034          CALL RTXCOV(IFCHNL(1,I),IFCHNL(1,J),IWKSPC,RHOARY,IXFLG)
      C
0035          RHOMAX = -10000.
0036          FDIF = FDIFA(M)
0037          DO 63,L = 1,IXFLG
0038          IF (RHOARY(L) .LE. RHOMAX) GO TO 63
0040          RHOMAX = RHOARY(L)
0041          FTDIF(M) = FDIF
0042       63 FDIF = FDIF - 1.
      C
0043          FRHO(M) = RHOMAX/(FSIGMA(I)*FSIGMA(J))
0044          FRHOVG = FRHOVG + FRHO(M)
0045       61 M = M + 1
0046          FRHOVG = FRHOVG/FNRDIF
      C
0047          CALL BEMEST
0048       62 IFSTAT = ISTAT
      C
0049          IDUM = IWKHDR(2) - 3
0050          IF (IDUM .LE. 0) IFROFG = 0
0052          IF (IFSTAT - 2) 66,69,68
0053       66 TYPE 10,CALLER
0054          GO TO 69
0055       68 IF (FRHOVG .GE. .59) IFROFG = IWKHDR(2)
0057          TYPE 12,IDUM,IWKHDR(2),FFSPQX,FAZVAR,FVEVAR,IFROFG,FAZIMF,FVELOC
0058       69 TYPE 14,CALLER,FTDIF,FRHOVG
0059          IF (FFSPQX .GT. 0.) RETURN
0061          TYPE 11,CALLER,FRHO
0062          DO 65,I = 1,IFCNBR
0063       65 TYPE 15,CALLER,IFMAX(I),IFMIN(I),FMU(I),FPSI(I),FSIGMA(I)
0064          RETURN
      C.....................................................................
      C
      C     Here's the three element (T) analysis.
      C
0065       59 IF (ITCNBR .EQ. 3) INRDIF = 3
0067          FNRDIF = FLOAT(INRDIF)
0068          DO 50,I = 1,ITCNBR
0069          CALL MAXMIN(ITCHNL(1,I),ITMAX(I),ITMIN(I))
0070          CALL MUNPSI(ITCHNL(1,I),TMU(I),TPSI(I))
0071          TSIGMA(I) = TPSI(I) - TMU(I)**2
0072          IF (TSIGMA(I) .LE. 0.) GO TO 52
0074          TSIGMA(I) = SQRT(TSIGMA(I))
0075          TPSI(I) = SQRT(TPSI(I))
0076          IAVG = INT(TMU(I))
0077          DO 50,IZ = 1,512
0078       50 ITCHNL(IZ,I) = ITCHNL(IZ,I) - IAVG
      C
0079          TRHOVG = 0.
0080          IEND = ITCNBR - 1
0081          JEND = ITCNBR
0082          M = 1
0083          DO 51,I = 1,IEND
```

```
0084          K = I + 1
      C
0085          DO 51,J = K,JEND
0086          IXFLG = IXFLGT(M)
0087          CALL RTXCOV(ITCHNL(1,I),ITCHNL(1,J),IWKSPC,RHOARY,IXFLG)
      C
0088          RHOMAX = -10000.
0089          TDIF = TDIFA(M)
0090          DO 53,L = 1,IXFLG
0091          IF (RHOARY(L) .LE. RHOMAX) GO TO 53
0093          RHOMAX = RHOARY(L)
0094          TTDIF(M) = TDIF
0095       53 TDIF = TDIF - .25
      C
0096          TRHO(M) = RHOMAX/(TSIGMA(I)*TSIGMA(J))
0097          TRHOVG = TRHOVG + TRHO(M)
0098       51 M = M + 1
0099          TRHOVG = TRHOVG/FNRDIF
      C
0100          CALL BEMEST
0101       52 ITSTAT = ISTAT
      C
0102          IF (IWKHDR(2) .LE. 1) ITROFG = 0
0104          IF (ITSTAT - 0) 56,57,54
0105       56 TYPE 10,CALLER
0106          GO TO 57
0107       54 IF (TRHOVG .GE. .59) ITROFG = IWKHDR(2)
0109          TYPE 13,IWKHDR(2),FTSPQX,TAZVAR,TVEVAR,ITROFG,TAZIMF,TVELOC
0110       57 TYPE 16,CALLER,TTDIF,TRHOVG
0111          IF (FTSPQX .GT. 0.) RETURN
0113          TYPE 11,CALLER,TRHO
0114          DO 58,I = 1,ITCNBR
0115       58 TYPE 15,CALLER,ITMAX(I),ITMIN(I),TMU(I),TPSI(I),TSIGMA(I)
      C.....................................................................
      C
0116       10 FORMAT (' ',A1,3X,'***INVALID ANALYSIS''***',$)
0117       11 FORMAT (' ',A1,3X,6F5.2,$)
0118       12 FORMAT (' F',I6,' to',I5,2X,F5.1,2F6.1,3X,'(',I4,')',2F8.2,$)
0119       13 FORMAT (' T',I6,9X,F6.2,2F6.1,19X,'(',I4,')',2F8.2,$)
0120       14 FORMAT (' ',A1,2X,6F5.1,F5.2,$)
0121       15 FORMAT (' ',A1,2I6,3F7.1,$)
0122       16 FORMAT (' ',A1,2X,7F5.2,$)
      C
0123          RETURN
0124          END
```

GLOSSARY OF FORTRAN VARIABLE NAMES

AMONTH	alphanumeric month
ANSWER	alphanumeric answer to prompt
ARRNBR	alphanumeric array flag
AZIMF	azimuth
AZVAR	azimuth standard deviation
BOTH	alphanumeric B
CALLER	alphanumeric array flag
DENOM	slowness
DET	determinant of least-squares matrix
DUMMY1	real component of cross-term of spectral matrix
DUMMY2	imaginary component of cross-term of spectral matrix
DUMMY3	magnitude of cross-term of spectral matrix
F1	least-squares solution factor
F1COEF	polarization filter coefficient
F1F1	square of F1
F1F2	F1 times F2
F2	least-squares solution factor
F2COEF	polarization filter coefficient
F2F2	square of F2
F8CHNL	real data array
FAZIMF	unfiltered F azimuth
FAZVAR	unfiltered F azimuth standard deviation
FBY1	least-squares error factor
FBY2	least-squares error factor
FBY3	least-squares error factor
FBY4	least-squares error factor
FBY5	least-squares error factor
FDIF	F time lags
FDIFA	maximum F time lag
FDIFB	unadjusted maximum F time lag
FFSPQX	real F spectral estimate
FIMGRY	imaginary FFT data
FMU	unfiltered F data average
FNRDIF	real number of channel pairs
FOUR	alphanumeric F
FPSI	unfiltered F data root-mean-square
FREARY	real FFT data
FRHO	unfiltered F cross-correlation coefficient for a channel pair
FRHOVG	unfiltered F average cross-correlation coefficient
FSIGMA	unfiltered F data standard deviation
FTDIF	F array time lags
FTRMAX	maximum power
FTSPQX	real T spectral estimate
FVELOC	unfiltered F velocity
FVEVAR	unfiltered F velocity standard deviation
FXDIF	F array X dimensions
FXDIFA	unadjusted F array X dimensions
FYDIF	F array Y dimensions
FYDIFA	unadjusted F array Y dimensions
I	DO loop index
II	DO loop index limit
I8CHNL	integer data array
IA2DBK	data buffer (as written to tape)

IXFLGF	number of F cross-correlation passes to perform
IXFLGT	number of T cross-correlation passes to perform
IYES	integer YES
IZ	index
J	index
JDAY	day
JEND	DO loop index limit
JFLAG	TCKCLK command flag
JHOUR	hour
JHRMIN	hour/minute code
JMIN	minute
JMONDA	month/day code
JP	index
JSEC	second
JTAIL	analysis results to pack into ITAIL
JXFLGF	unadjusted number of F cross-correlation passes to
JXFLGT	unadjusted number of T cross-correlation passes to
JYEAR	year
K	DO loop index
KK	index
L	index
LP	index
M	index
MIXUP	channel mix array
N	index
PIOVRN	PI divided by 512
POLARZ	polarization filter spectrum
RADDEG	radians to degrees conversion factor
RHOARY	cross-correlation array
RHOMAX	maximum cross-correlation
RINDX	real index
TAZIMF	unfiltered T azimuth
TAZVAR	unfiltered T azimuth standard deviation
TBYT	sum of time lags squared
TDIF	T time lags
TDIFA	maximum T time lag
TDIFB	unadjusted maximum T time lag
TEMP1	temporary endpoint storage
TEMP2	temporary endpoint storage
TEMP3	temporary endpoint storage
TERRSQ	square of total error
THETA	azimuth
THETAN	real FFT parameter
THREE	alphanumeric 3
TMU	unfiltered T data average
TPSI	unfiltered T data root-mean-square
TRACED	square of trace of spectral matrix
TRACEM	maximum power
TRACEN	trace of spectral matrix squared
TRACET	normalization factor
TRHO	unfiltered T cross-correlation coefficient for a c
TRHOVG	unfiltered T average cross-correlation coefficient
TSIGMA	unfiltered T data standard deviation
TTDIF	T array time lags
TVELOC	unfiltered T velocity

^.E.AR	unfiltered ^ velocity standard deviation
^XDIF	^ array X dimensions
^XDIFA	unadjusted ^ array X dimensions
^YDIF	^ array Y dimensions
^YDIFA	unadjusted ^ array Y dimensions
V2	velocity squared
V4	velocity to the fourth power
VECTOR	array to be smoothed
VELOC	velocity
VE.AR	velocity standard deviation
XBYT	sum of X dimensions times time lags
XBYX	sum of X dimensions squared
XBYY	sum of X dimensions times Y dimensions
XDIF	X dimension differences
XNO	alphanumeric N
XONE	standard deviation factor
YBYT	sum of Y dimensions times time lags
YBYY	sum of Y dimensions squared
YDIF	Y dimension differences
YES	alphanumeric Y

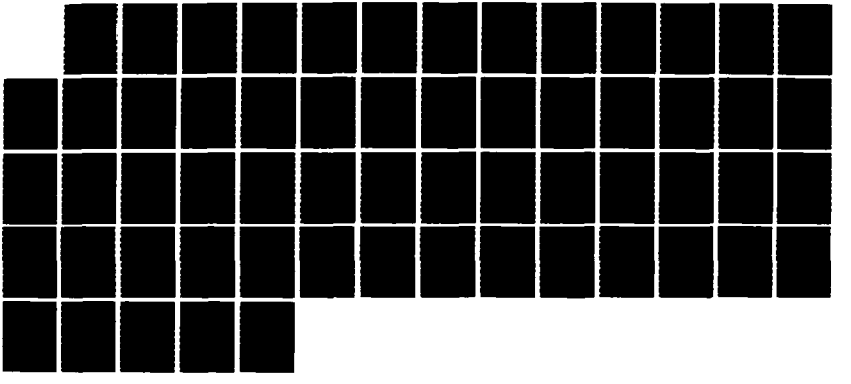
MACRO SUBROUTINES

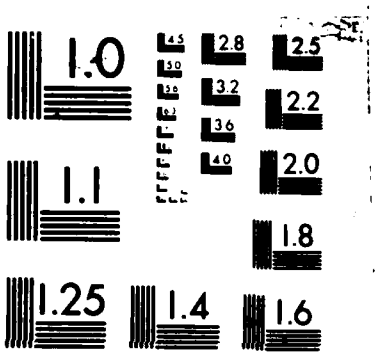
RT-11 LIBRARIAN V03.05 MON 30-JAN-84 00:00:00
MACLIB FRI 18-NOV-83 00:00:00

MODULE	GLOBALS	GLOBALS	GLOBALS
TAPEIO	EOFTAP	INITAP	REDTAP
*	REWTAP	SPCTAP	STATAP
*	WRITAP		
	FFT512		
	MAXMIN		
	MUNPSI		
	RTXCOV		
	UNWIND		
	FLTIX4		
	TCKCLK		
	A2DTCK	INIA2D	

AD-A176 804 ANTARCTIC ATMOSPHERIC INFRASOUND(U) ALASKA UNIV FAIRBANKS GEOPHYSICAL INST C R WILSON ET AL. NOV 86 AFOSR-TR-87-0162 F49620-81-C-0091 3/3

UNCLASSIFIED F/G 4/2 NL





```
;*****************************************************************************
;
; The date of this revision is 18 Sep 1980.
;
;
;01  The following collection of MACRO routines were created to control
;  the Digi-Data model nr 1730 tape transport via a Digi-Data PDP-11
; interface and NRZI formatter and an Able Computer Technology model nr
; 10001 Univerter.
;
;
;02  Although Digital Equipment Corp. (DEC) offers both the hardware and
; software for a tape system on its larger PDP-11 series computers, at the
; time of this writing, DEC does not offer a software driver which will
; run on the LSI-11 series computers.  Digi-Data offers its package as a
; hardware substitiute for the DEC TM-11 tape deck, the Univerter serves
; as the hardware interface between the LSI-11 Q-bus and the Unibus struc-
; tured tape hardware and this ensemble of MACRO routines is the software
; driver/controller.
;
;
;03  The author of this and splay problem is:
;
;                   B. David Spell  EE
;                   Dept. of Electrical Engineering
;                   University of Alaska
;                   Fairbanks, Alaska  99701  USA
;                   (907) 474-7819
;
;
;04  INITAP: (IUNIT,IDNSTY,IPARTY,ISTATU)  A routine to initialize the
; tape system and to return with the tape system operating status after
; the initialization attempt.  The formatter/tape deck are NRZI, 9 track,
; odd parity and 800 BPI.  Hence, IDNSTY must be 200 and IPARTY must be 1
; (for odd).  These arguments are here for future expansion and any value
; except 800 and 1 will cause a premature return from INITAP with an INO
; (-1) in ISTATU(1).  ISTATU is an INTEGER*2 array of at least 6 words
; which, as diagrammed in the attached flow chart and listed in the below
; paragraph, passes the status of the tape system back to the callerIUNIT is an inte
ger from 0 to 4 specifying which of 4 pos-
; sible tape drives the caller wants to address.
;
;
;06  ISTATU:  An array of words which pass back to the caller, information
; about the call.  As listed below, INITAP requires an array of 6 words,
; STATAP requires an array of at least 12 words, and all other routines
; require only one word.  Note that STATAP has two possible configurations,
; one if ILLC is IYES, signifying an illegal command and testing the reasons
; for it and the other when ILLC is INO with a subsequent listing of error
; tests.
```

```
;       ISTATU.....INITAP.....STATAP.....ALL OTHERS
;       ..........................................
;       ISTATU(1)......SUCCESS.....ILLC:IYES/INO.....SUCCESS
;       ISTATU(2).....BOT.....MTC/NXM.....
;       ISTATU(3).....SELR.....SELR/BTE.....
;       ISTATU(4).....TUR.....CURD/RLE.....
;       ISTATU(5).....RSTAT.....FPRO/EOT.....
;       ISTATU(6).....FPRO.....***/BGL.....
;       ISTATU(7).....***/PAE.....
;       ISTATU(8).....***/EOF.....
;       ISTATU(9).....***/MTS.....
;       ISTATU(10).....***/MTC.....
;       ISTATU(11).....***/MTBRC.....
;       ISTATU(12).....***/MTCMA.....
;
;
;07  STATAP: (IUNIT,ISTATU) A routine to determine the status of the tape
; system.  The tape controller broadcasts the status of the system via se-
; lected bits in the MTC (control register), MTS (status register), MTBRC
; (byte record counter) and MTCMA (current memory address).  A call to
; STATAP will test and display the value (set/clear) of selected bits.
; STATAP should be invoked, after an error return from another routine,
; to determine the cause of the error.  IUNIT is the unit number (0 to 4).
; ISTATU is, as listed previously, an array of at least 12 words which is
; filled as diagrammed in the attached flow chart.
;
;
;08  SPCTAP: (IUNIT,ICOUNT,ISTATU) A routine to space (skip) records on a
; magtape.  IUNIT is the unit number (0 to 4).  ISTATU indicates whether
; the call was successful.  ICOUNT is the number of records to space, with
; a negative integer indicating reverse spacing and vice-versa.
;
;
;09  REWTAP: (IUNIT,ISTATU) A routine to rewind the tape.  Call arguments
; are as previously explained.
;
;
;10  EOFTAP: (IUNIT,ISTATU) A routine to write an EOF (end-of-file) on the
; magtape.  Call arguments are as previously explained.  It is of interest
; that writing an EOF in a "read-after-write" situation will generate an
; EOF error.  Consequently, this routine is structured to give an error re-
; turn (ISTATU(1)=INO) if no error is detected or, if one is, it is not
; an EOF error.
;
;
;11  WRITAP: (IUNIT,IBKADR,IBYTSZ,ISTATU) A routine to write information on
; the magtape.  IUNIT is the unit number (0 to 4).  IBKADR is the address
; of an array or a block in memory which contains the data to be written
; onto the tape.  IBYTSZ is the number of BYTEs (8 bit words) which are to
; be written onto the tape.  ISTATU is a word describing the success or
; failure or the write command.  All error conditions will immediately gener-
; ate an INO into this word, except PAE (parity error).  If a PAE is de-
; tected, the routine will try to rewrite the data eight (8) times.  If
; a PAE is still detected, the routine will try once to write with an ex-
; tended gap preceeding the data.  If that method fails also, an INO is
; generated into ISTATU and the routine returns.
```

```
                        ;*****************************************************************
                        ;
                        ;12  REDTAP: (IUNIT,IBKADR,IBYTSZ,ISTATU) This routine is used to read mag-
                        ; tapes.  The arguments are as described under WRITAP except substitute
                        ; read for write and this routine does not read with an extended gap, but
                        ;rather, generates an IND in ISTATU and exits after just eight (8) tries.
                        ;
                        ;*****************************************************************
                        ;
                                .TITLE SOFTWARE TAPE CONTROLLER/DRIVER
                        ;
000000                          .CSECT TAPEIO
                        ;
                                .GLOBL INITAP, STATAP, SPCTAP, REWTAP, EOFTAP, WRITAP, REDTAP
                        ;
                                .MCALL ..V2.., .REGDEF, .PRINT
000000                          ..V2..
000000                          .REGDEF
                        ;
                        ;......SYMBOL TABLE.....................................................
                        ;
000001                            YES = 1
177777                            NO = -1
000020                          TRPVEC = 20       ; I/O TRAP VECTOR ADDRESS
                        ;
                        ;......TAPE CONTROLLER PORTS.............................................
                        ;
172520                            MTS = 172520    ; STATUS ADDR
172522                            MTC = 172522    ; COMMAND ADDR
172524                          MTBRC = 172524    ; BYTE CNTR ADDR
172526                          MTCMA = 172526    ; CURRENT BUFF ADDR
172530                            MTD = 172530    ; DATA BUFFER
172532                           MTRD = 172532    ; READ LINES
172534                          MTOPT = 172534    ; EXT FUNCT
172536                            MTV = 172536    ; VECTOR (= 224 & PROTECTED BY PATCH TO MONITR.SYS)
                        ;
                        ;......COMMANDS.........................................................
                        ;
                        ;MTC BIT SET/RESET PATTERNS: BINARY-LSB LAST
                        ;
000000                          OFFLIN = ^B00000
000002                            READ = ^B00010
000004                           WRITE = ^B00100
000006                          FILMRK = ^B00110
000010                          SPCFWD = ^B01000
000012                          SPCREV = ^B01010
000014                          EXTNGP = ^B01100
000016                          REWIND = ^B01110
                        ;
                        ;MTC BIT SET/RESET PATTERNS: OCTAL-LSB LAST
                        ;
010000                            PCLR = 10000    ; POWER CLEAR
                        ;
                        ;......DRIVE STATUS.....................................................
                        ;
                        ;MTC BIT SET/RESET PATTERNS: BINARY-LSB LAST
                        ;
```

```
                        DRVSTA = ^B0110000000000000; 9 TRACK, NRZI, ODD PARITY, 800 BPI
                               ^BX11X00XXXXXXXXX: X'S DENOTE BITS NOT USED FOR
                                                  DRVSTA DEFINITION

                          CURD = ^B10000000; CONTROL UNIT READY

                        ;MTS BIT SET/RESET PATTERNS: OCTAL-LSB LAST

                           SELR =   100  ; SELECT REMOTE (ON-LINE)
                            BOT =    40  ; BEGINNING OF TAPE
                           FPRO =     4  ; FILE PROTECTED (RING OUT)
                          RSTAT =     2  ; REWIND STATUS
                            TUR =     1  ; TAPE UNIT READY

                        ;......ERRORS.....................................................

                        ;MTS BIT SET/RESET PATTERNS: OCTAL-LSB LAST

                           ILLC = 100000  ; ILLEGAL COMMAND
                            EOF =  40000  ; END OF FILE READ
                              ; =  20000  ; NOT USED
                            PAE =  10000  ; PARITY ERROR
                            BGL =   4000  ; BUS GRANT LATE*
                            EOT =   2000  ; END OF TAPE READ
                            RLE =   1000  ; RECORD LENGTH ERROR
                            BTE =    400  ; BAD TAPE-DATA DURING GAP
                            NXM =    200  ; NON-EXISTENT MEMORY

                        ;MTC BIT SET/RESET PATTERNS: OCTAL-LSB LAST

                            ERR = 100000  ; ERROR CONDITION

                        ;......MACROS.....................................................

                                .MACRO GOTAP
                                TSTB MTC          ; IS MTC READY FOR COMMAND?
                                BPL .-4           ; NO
                                INC MTC           ; YES, GO TAPE!
                                TSTB MTC          ; DONE YET?
                                BPL .-4           ; NO
                                .ENDM

                                .MACRO SPACE
                                MOV @NO, MTBRC    ; 2'S COMPLEMENT OF 1 RECORD
                                MOVB @SPCREV, MTC ; GO BACK 1 RECORD
                                GOTAP
                                TST MTC           ; GOOD RETURN?
                                BMI 66$           ; NO, ERROR OUT
                                MOV @NO, MTBRC    ; 2'S COMPLEMENT OF 1 RECORD
                                MOVB @SPCFWD, MTC ; RECOVER THE GOOD BACKSPACED RECORD
                                GOTAP
                           66$: TST MTC           ; GOOD RETURN?
                                .ENDM

                                .MACRO MNTSEL
                                MOV @2(R5), SCRAT@
                                CMP @@, SCRAT@    ; SCRAT@ HOLDS MOUNT NUMBER
```

```
                                        BLE .+6          ; IS MOUNT NBR NEGATIVE?
                                        IOT              ; YES, ERROR RETURN
                                        RTS PC
                                        CMP #4, SCRAT0   ; IS MOUNT NBR LARGER THAN 4?
                                        BLE .-10         ; YES, ERROR RETURN
                                       SWAB SCRAT0          ;SHIFT MOUNT NBR 8 PLACES LEFT
                                        ADD #DRVSTA, SCRAT0; TOTAL MOUNT DRIVE STATUS
                                        MOV SCRAT0, MTC
                                        .ENDM
                                ;
                                ;.....MACRO EXPANSION (UNDER MACRO).....................
                                ;
                                        .LIST ME
000000                                  GOTAP
000000  105767  172522                  TSTB MTC         ; IS MTC READY FOR COMMAND?
000004  100375                          BPL .-4          ; NO
000006  005267  172522                  INC MTC          ; YES, GO TAPE!
000012  105767  172522                  TSTB MTC         ; DONE YET?
000016  100375                          BPL .-4          ; NO
                                ;
000020                                  SPACE
000020  012767  177777  172524          MOV #NO, MTBRC   ; 2'S COMPLEMENT OF 1 RECORD
000026  112767  000012  172522          MOVB #SPCREV, MTC ; GO BACK 1 RECORD
000034                                  GOTAP
000034  105767  172522                  TSTB MTC         ; IS MTC READY FOR COMMAND?
000040  100375                          BPL .-4          ; NO
000042  005267  172522                  INC MTC          ; YES, GO TAPE!
000046  105767  172522                  TSTB MTC         ; DONE YET?
000052  100375                          BPL .-4          ; NO
000054  005767  172522                  TST MTC          ; GOOD RETURN?
000060  100416                          BMI 66$          ; NO, ERROR OUT
000062  012767  177777  172524          MOV #NO, MTBRC   ; 2'S COMPLEMENT OF 1 RECORD
000070  112767  000010  172522          MOVB #SPCFWD, MTC ; RECOVER THE GOOD BACKSPACED RECORD
000076                                  GOTAP
000076  105767  172522                  TSTB MTC         ; IS MTC READY FOR COMMAND?
000102  100375                          BPL .-4          ; NO
000104  005267  172522                  INC MTC          ; YES, GO TAPE!
000110  105767  172522                  TSTB MTC         ; DONE YET?
000114  100375                          BPL .-4          ; NO
000116  005767  172522             66$: TST MTC          ; GOOD RETURN?
                                ;
000122                                  MNTSEL
000122  017567  000002  002466          MOV @2(R5), SCRAT0
000130  022767  000000  002460          CMP #0, SCRAT0   ; SCRAT0 HOLDS MOUNT NUMBER
000136  003402                          BLE .+6          ; IS MOUNT NBR NEGATIVE?
000140  000004                          IOT              ; YES, ERROR RETURN
000142  000207                          RTS PC
000144  022767  000004  002444          CMP #4, SCRAT0   ; IS MOUNT NBR LARGER THAN 4?
000152  003773                          BLE .-10         ; YES, ERROR RETURN
000154  000367  002436                 SWAB SCRAT0          ;SHIFT MOUNT NBR 8 PLACES LEFT
000160  062767  060000  002430          ADD #DRVSTA, SCRAT0; TOTAL MOUNT DRIVE STATUS
000166  016767  002424  172522          MOV SCRAT0, MTC
                                ;
                                        .NLIST ME
                                ;
                                ;*********************************************************************
                                ;
```

```
                                ;.....................................................................
                                ;
000174                          INITAP:                 ;..CALL INITAP (IUNIT,IDNSTY,IPARTY,ISTATU)..
000174 010167 002420                    MOV R1,SCRAT1           ;SAVE R1
000200 012701 000020                     MOV #TRPVEC, R1    ; SET UP TRAP
000204 012721 002524'                    MOV #TRPTLK, (R1)+
000210 012711 000200                     MOV #200, (R1)
000214 122715 000004                     CMPB #4, (R5)      ; FOUR ARGUMENTS?
000220 001123                            BNE 1$             ; NO, FATAL ERROR
000222 016501 000010                     MOV 10(R5), R1     ; ADDRESS OF TOP OF STATUS ARRAY
000226 012721 000001                     MOV #YES, (R1)+    ; OKAY STATUS, SO FAR
000232 022775 001440 000004              CMP #800., @4(R5)  ; IS 800 BPI SPECIFIED?
000240 001107                            BNE 3$             ; NO, ERROR RETURN
000242 022775 000001 000006              CMP #1, @6(R5)     ; IS PARITY SPECIFIED ODD?
000250 001103                            BNE 3$             ; NO, ERROR RETURN
000252 012767 010000 172522              MOV #PCLR, MTC     ; CLEAR THE CONTROL UNIT
000260                                   MNTSEL
000332 032767 000040 172520              BIT #BOT, MTS      ; IS TAPE UNIT AT BOT AND ON LINE?
000340 001430                            BEQ 4$             ; NO, SEE IF TAPE UNIT IS ON LINE
000342 012721 000001                     MOV #YES, (R1)+    ; TAPE UNIT IS AT BOT
000346 012721 000001                7$:  MOV #YES, (R1)+    ; TAPE UNIT IS ON LINE, TOO
000352 032767 000001 172520              BIT #TUR, MTS      ; IS TAPE UNIT READY?
000360 001430                            BEQ 6$             ; NO, SEE IF REWINDING
000362 012721 000001                     MOV #YES, (R1)+    ; TAPE UNIT IS READY
000366 012721 177777                     MOV #NO, (R1)+     ; NOT REWINDING IF READY
000372 032767 000004 172520              BIT #FPRO, MTS     ; IS TAPE WRITE PROTECTED?
000400 001005                            BNE 5$             ; YES, SAY SO AND RETURN
000402 012711 177777                2$:  MOV #NO, (R1)      ; NOT WRITE PROTECTED
000406 016701 002206                20$: MOV SCRAT1,R1          ;RESTORE R1
000412 000207                            RTS PC
000414 012711 000001                5$:  MOV #YES, (R1)     ; WRITE PROTECTED
000420 000772                           BR 20$
000422 012721 177777                4$:  MOV #NO, (R1)+     ; TAPE IS NOT AT BOT
000426 032767 000100 172520              BIT #SELR, MTS     ; IS TAPE UNIT ON LINE?
000434 001344                            BNE 7$             ; YES, SEE IF TAPE UNIT READY
000436 012721 177777                     MOV #NO, (R1)+     ; TAPE UNIT NOT ON LINE
000442 012721 177777                6$:  MOV #NO, (R1)+     ; TAPE UNIT NOT READY
000446 032767 000002 172520              BIT #RSTAT, MTS    ; IS TAPE UNIT IN REWIND?
000454 001357                            BNE 5$             ; YES, SAY SO AND RETURN
000456 000751                            BR 2$
000460 012775 177777 000010         3$:  MOV #NO, @10(R5)  ; INITAP CALLING ERROR RETURN
000466 000747                           BR 20$
000470 000004                       1$:  IOT
000472 000745                           BR 20$
                                ;
                                ;.....................................................................
                                ;
000474                          STATAP:                 ;..CALL STATAP (IUNIT,ISTATU)..
000474 010167 002120                    MOV R1,SCRAT1           ;SAVE R1
000500 122715 000002                     CMPB #2, (R5)      ; TWO ARGUMENTS?
000504 001177                            BNE 16$            ; NO, FATAL ERROR
000506                                   MNTSEL
000560 016501 000004                     MOV 4(R5), R1      ; ADDRESS OF STATUS ARRAY IN R1
000564 032767 100000 172520              BIT #ILLC, MTS     ; IS ILLC ERROR?
000572 001427                            BEQ 15$            ; NO, CHECK OTHER ASPECTS
000574 012721 000001                     MOV #YES, (R1)+    ; YES, FIND OUT WHY
000600 032767 000100 172520              BIT #SELR, MTS     ; IS UNIT ON LINE?
```

```
313 000606  001533                     BEQ 17$          ; NO, HERE'S THE REASON
314 000610  012721  000001             MOV #YES, (R1)+
315 000614  032767  000200  172522      BIT #CURD, MTC   ; IS CONTROL UNIT READY?
316 000622  001525                     BEQ 17$          ; NO, HERE'S THE REASON
317 000624  012721  000001             MOV #YES, (R1)+
318 000630  016721  172522             MOV MTC, (R1)+   ; MTC IS HERE (FOR DENSITY LOOK)
319 000634  032767  000004  172520      BIT #FPRO, MTS   ; IS TAPE FILE PROTECTED?
320 000642  001515                     BEQ 17$          ; NO
321 000644  012711  000001             MOV #YES, (R1)
322 000650  000516                     BR 20$
323 000652  012721  177777      15$:   MOV #NO, (R1)+
324 000656  032767  000200  172520      BIT #NXM, MTS    ; IS NXM ERROR?
325 000664  001403                     BEQ 1$           ; NO, MOVE ON
326 000666  012721  000001             MOV #YES, (R1)+
327 000672  000402                     BR 2$
328 000674  012721  177777       1$:   MOV #NO, (R1)+
329 000700  032767  000400  172520     2$:   BIT #BTE, MTS    ; IS BTE ERROR?
330 000706  001403                     BEQ 3$           ; NO, MOVE ON
331 000710  012721  000001             MOV #YES, (R1)+
332 000714  000402                     BR 4$
333 000716  012721  177777       3$:   MOV #NO, (R1)+
334 000722  032767  001000  172520     4$:   BIT #RLE, MTS    ; IS RLE ERROR?
335 000730  001403                     BEQ 5$           ; NO, MOVE ON
336 000732  012721  000001             MOV #YES, (R1)+
337 000736  000402                     BR 6$
338 000740  012721  177777       5$:   MOV #NO, (R1)+
339 000744  032767  002000  172520     6$:   BIT #EOT, MTS    ; IS EOT ERROR?
340 000752  001403                     BEQ 7$           ; NO, MOVE ON
341 000754  012721  000001             MOV #YES, (R1)+
342 000760  000402                     BR 8$
343 000762  012721  177777       7$:   MOV #NO, (R1)+
344 000766  032767  004000  172520     8$:   BIT #BGL, MTS    ; IS BGL ERROR?
345 000774  001403                     BEQ 9$           ; NO, MOVE ON
346 000776  012721  000001             MOV #YES, (R1)+
347 001002  000402                     BR 10$
348 001004  012721  177777       9$:   MOV #NO, (R1)+
349 001010  032767  010000  172520    10$:   BIT #PAE, MTS    ; IS PAE ERROR?
350 001016  001403                     BEQ 11$          ; NO, MOVE ON
351 001020  012721  000001             MOV #YES, (R1)+
352 001024  000402                     BR 12$
353 001026  012721  177777      11$:   MOV #NO, (R1)+
354 001032  032767  040000  172520    12$:   BIT #EOF, MTS    ; IS EOF ERROR?
355 001040  001403                     BEQ 13$          ; NO, MOVE ON
356 001042  012721  000001             MOV #YES, (R1)+
357 001046  000402                     BR 14$
358 001050  012721  177777      13$:   MOV #NO, (R1)+
359 001054  016721  172520      14$:   MOV MTS, (R1)+   ; HERE'S MTS
360 001060  016721  172522             MOV MTC, (R1)+   ; HERE'S MTC
361 001064  016721  172524             MOV MTBRC, (R1)+ ; HERE'S MTBRC
362 001070  016711  172526             MOV MTCMA, (R1)  ; HERE'S MTCMA
363 001074  000404                     BR 20$
364 001076  012711  177777      17$:   MOV #NO, (R1)
365 001102  000401                     BR 20$
366 001104  000004              16$:   IOT
367 001106  016701  001586      20$:   MOV SCRAT1,R1          ;RESTORE R1
368 001112  000207                     RTS PC
369                             ;
```

```
                                ;.....................................................................
                                ;
001114                  SPCTAP:                 ;..CALL SPCTAP (IUNIT,ICOUNT,ISTATU)..
001114 122715 000003            CMPB #3, (R5)   ; THREE ARGUMENTS?
001120 001073                   BNE 1$          ; NO, FATAL ERROR
001122                          MNTSEL
001174 017567 000004 001416     MOV @4(R5), SCRAT1; GET NUMBER OF RECORDS TO SKIP
001202 112767 000012 172522     MOVB #SPCREV, MTC ; ASSUME REVERSE SPACE
001210 005767 001404            TST SCRAT1      ; FORWARD OR BACKWARDS?
001214 100407                   BMI 3$          ; BACKWARDS
001216 005167 001376            COM SCRAT1      ; CALCULATE 2'S COMPLEMENT OF FORWARD COUNT
001222 005267 001372            INC SCRAT1
001226 112767 000010 172522     MOVB #SPCFWD, MTC ; FORWARD SPACE
001234 016767 001360 172524  3$: MOV SCRAT1, MTBRC ; NUMBER OF RECORDS TO SKIP
001242                          GOTAP
001262 005767 172522            TST MTC         ; DONE, LOOK FOR ERROR RETURN
001266 100404                   BMI 2$          ; ERROR RETURN
001270 012775 000001 000006     MOV #YES, @6(R5) ; GOOD RETURN
001276 000207                   RTS PC
001300 012775 177777 000006  2$: MOV #NO, @6(R5)
001306 000207                   RTS PC
001310 000004                1$: IOT
001312 000207                   RTS PC
                                ;
                                ;.....................................................................
                                ;
001314                  REWTAP:                 ;..CALL REWTAP (IUNIT,ISTATU)
001314 122715 000002            CMPB #2, (R5)   ; TWO ARGUMENTS?
001320 001053                   BNE 1$          ; NO, ERROR RETURN
001322                          MNTSEL
001374 112767 000016 172522     MOVB #REWIND, MTC ; SET UP REWIND
001402                          GOTAP
001422 005767 172522            TST MTC         ; DONE, LOOK FOR ERROR RETURN
001426 100404                   BMI 2$          ; ERROR
001430 012775 000001 000004     MOV #YES, @4(R5) ; GOOD RETURN
001436 000207                   RTS PC
001440 012775 177777 000004  2$: MOV #NO, @4(R5)
001446 000207                   RTS PC
001450 000004                1$: IOT
001452 000207                   RTS PC
                                ;
                                ;.....................................................................
                                ;
001454                  EOFTAP:                 ;..CALL EOFTAP (IUNIT,ISTATU)..
001454 122715 000002            CMPB #2, (R5)   ; TWO ARGUMENTS?
001460 001057                   BNE 1$          ; NO, FATAL ERROR
001462                          MNTSEL
001534 112767 000006 172522     MOVB #FILMRK, MTC ; WRITE EOF
001542                          GOTAP
001562 005767 172522            TST MTC         ; DONE, LOOK FOR EOF ERROR
001566 002010                   BGE 3$          ; NO ERROR IS ERROR RETURN
001570 032767 040000 172520     BIT #EOF, MTS   ; IS EOF ERROR?
001576 001404                   BEQ 3$          ; NO, ERROR RETURN
001600 012775 000001 000004     MOV #YES, @4(R5) ; YES, ASSUME IT'S THE ONLY ONE
001606 000207                   RTS PC
001610 012775 177777 000004  3$: MOV #NO, @4(R5) ; ERROR RETURN
001616 000207                   RTS PC
```

```
001620  000004          1$:  IOT
001622  000207               RTS PC
                        ;
                        ;.....................................................................
                        ;
001624                  WRITAP:                 ;..CALL WRITAP (IUNIT,IBKADR,IBYTSZ,ISTATU)..
001624  122715  000004        CMPB #4, (R5)     ; FOUR ARGUMENTS?
001630  001157                BNE 1$            ; NO, FATAL ERROR
001632                        MNTSEL
001704  012767  000011 000702    MOV #9., RETRY    ; 8 TRIES
001712  112767  000004 172522  7$:  MOVB #WRITE, MTC  ; SET UP WRITE
001720  022767  000001 000666    CMP #1, RETRY     ; 8 TRIES YET?
001726  001514                BEQ 6$            ; YES, WRITE WITH EXTENDED GAP
001730  022767  000000 000656    CMP #0, RETRY     ; EXTENDED GAP WRITE STILL FAILED?
001736  001504                BEQ 3$            ; YES, ERROR RETURN
001740  016567  000004 172526  5$:  MOV 4(R5), MTCMA  ; ADDRESS OF BUFFER INTO CMA
001746  017567  000006 000644    MOV @6(R5), SCRAT1; CALCULATE 2'S COMPLEMENT OF COUNT
001754  005167  000640          COM SCRAT1
001760  005267  000634          INC SCRAT1
001764  016767  000630 172524    MOV SCRAT1, MTBRC ; 2'S COM INTO BRC
001772                        GOTAP
002012  005767  172522          TST MTC           ; DONE, IS ERROR END?
002016  100404                BMI 4$            ; YES, ERROR RETURN
002020  012775  000001 000010    MOV #YES, @10(R5) ; GOOD RETURN
002026  000207                RTS PC
002030  032767  010000 172520  4$:  BIT #PAE, MTS     ; IS PARITY ERROR?
002036  001444                BEQ 3$            ; NO, ERROR RETURN
002040  005367  000550          DEC RETRY         ; RESTART AND TRY AGAIN
002044                        SPACE
002146  100261                BPL 7$            ; DONE, GOOD RETURN?
002150  012775  177777 000010  3$:  MOV #NO, @10(R5)  ; ERROR RETURN
002156  000207                RTS PC
002160  112767  000014 172522  6$:  MOVB #EXTNGP, MTC ; SET UP EXTENDED GAP WRITE
002166  000664                BR 5$
002170  000004          1$:  IOT
002172  000207               RTS PC
                        ;
                        ;.....................................................................
                        ;
002174                  REDTAP:                 ;..CALL REDTAP (IUNIT,IBKADR,IBYTSZ,ISTATU)..
002174  122715  000004        CMPB #4, (R5)     ; FOUR ARGUMENTS?
002200  001147                BNE 1$            ; NO, FATAL ERROR
002202                        MNTSEL
002254  012767  000010 000332    MOV #8., RETRY    ; 8 TRIES
002262  112767  000002 172522  5$:  MOVB #READ, MTC   ; SET UP READ
002270  022767  000000 000316    CMP #0, RETRY     ; 8 TRIES YET?
002276  001504                BEQ 3$            ; YES, ERROR RETURN
002300  016567  000004 172526    MOV 4(R5), MTCMA  ; ADDRESS OF BUFFER INTO CMA
002306  017567  000006 000304    MOV @6(R5), SCRAT1; CALCULATE 2'S COMPLEMENT OF COUNT
002314  005167  000300          COM SCRAT1
002320  005267  000274          INC SCRAT1
002324  016767  000270 172524    MOV SCRAT1, MTBRC ; 2'S COMPLEMENT INTO BRC
002332                        GOTAP
002352  005767  172522          TST MTC           ; IS ERROR RETURN?
002356  100404                BMI 4$            ; YES, SEE WHAT KIND
002360  012775  000001 000010    MOV #YES, @10(R5) ; GOOD RETURN
002366  000207                RTS PC
```

```
484 002370  032767  010000  172520      1$:  BIT #PAE, MTS     ; PARITY ERROR?
485 002376  001444                          BEQ 3$            ; NO, ERROR RETURN
486 002400  005367  000210                  DEC RETRY         ; GO BACK AND RETRY
487 002404                                  SPACE
488 002506  100265                          BPL 5$            ; GOOD RETURN?
489 002510  012775  177777  000010      3$:  MOV #NO, @10(R5)  ; ERROR RETURN
490 002516  000207                          RTS PC
491 002520  000004                      1$:  IOT
492 002522  000207                          RTS PC
493                                     ;
494                                     ;.....................................................................
495                                     ;
496 002524                              TRPTLK:  .PRINT #TALK
497 002532  000006                          RTT
498                                     ;
499                                     ;.....................................................................
500                                     ;
501 002534     040     052     052       TALK:  .ASCIZ ' *****FATAL-ILLEGAL CALL ARGUMENTS-TAPEIO*****'
    002537     052     052     052
    002542     106     101     124
    002545     101     114     055
    002550     111     114     114
    002553     105     107     101
    002556     114     040     103
    002561     101     114     114
    002564     040     101     122
    002567     107     125     115
    002572     105     116     124
    002575     123     055     124
    002600     101     120     105
    002603     111     117     052
    002606     052     052     052
    002611     052     000
502                                             .EVEN
503 002614                                  RETRY:  .BLKW
504 002616                                  SCRAT0: .BLKW
505 002620                                  SCRAT1: .BLKW
506                                     ;
507         000001                              .END
```

SYMBOL TABLE

```
BGL    = 004000        FILMRK= 000006        MTS    = 172520        REWIND= 000016        STATAP  000474RG    002
BOT    = 000040        FPRO  = 000004        MTV    = 172536        REWTAP  001314RG    002 TALK    002534R     002
BTE    = 000400        ILLC  = 100000        NO     = 177777        RLE    = 001000       TRPTLK  002524R     002
CURD   = 000200        INITAP  000174RG    002 NXM    = 000200        RSTAT = 000002        TRPVEC= 000020
DRVSTA= 060006         MTBRC = 172524          OFFLIN= 000000        SCRAT0  002616R     002 TUR    = 000001
EOF    = 040000        MTC   = 172522          PAE    = 010000        SCRAT1  002620R     002 WRITAP  001624RG    002
EOFTAP  001454RG    002 MTCMA = 172526         PCLR  = 010000        SELR  = 000100         WRITE = 000004
EOT    = 002000        MTD   = 172530          READ   = 000002        SPCFWD= 000010         YES   = 000001
ERR    = 100000        MTOPT = 172534          REDTAP  002174RG    002 SPCREV= 000012         ...V1 = 000002
EXTNGP= 000014         MTRD  = 172532          RETRY   002614R     002 SPCTAP  001114RG    002
```

```
. ABS.  000000    000
        000000    001
TAPEIO  002622    002
ERRORS DETECTED:  0
```

```
VIRTUAL MEMORY USED:  1952 WORDS  ( 8 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  58 PAGES
```

```
      C************  AZSCAN.FOR  ********************************************
      C
      C     Date of revision: 15-Oct-84
      C
0001        PROGRAM AZSCAN
      C
      C     PURPOSE
      C        To scan a tape for blocks of interest within a user specified
      C        azimuth range.
      C
      C     USAGE
      C        RUN AZSCAN
      C
      C     INPUT PARAMETERS
      C        YEAR    - A two digit integer
      C        F,T,B   - Selects F array, T array, or Both arrays
      C        RHOMIN  - Minimum average PREfiltered correlation coefficient for
      C                  blocks of interest (default 0.6 if T, 0.5 if F)
      C        STATS   - If Y is entered, statistics will be printed for each
      C                  block of interest
      C        ALL     - If Y is entered, data for all blocks in range will
      C                  be printed.  Otherwise, only the first and last.
      C        NRCHNL  - Number of channels in array (default 4)
      C        AZMIN   - Minimum value of azimuth range (0. < AZMIN < 360.)
      C        AZMAX   - Maximum value of azimuth range (0. < AZMAX < 360.)
      C        VELMIN  - Minimum value of velocity range (default 250.)
      C        VELMAX  - Maximum value of velocity range (default 700.)
      C        CVMAX   - Maximum value of velocity variance (default 10000.)
      C        START   - Integer value of first block to be scanned
      C        STOP    - Integer value of last block to be scanned
      C        BEYOND  - If Y is entered, another scan is permitted
      C        REWIND  - If Y is entered, tape is rewound and another scan is
      C                  permitted
      C
      C     REMARKS
      C        When the azimuth range includes 360. degrees, it is acceptable
      C        to enter a value of AZMIN that is larger than AZMAX, i.e.
      C        AZMIN=345. and AZMAX=25. covers the range including 360. degrees
      C
      C     LIBRARIES REQUIRED
      C        REDLIB,MACLIB
      C
      C     METHOD
      C        The program scans the trailer data of the tape starting at START.
      C        If the value of RHO is greater than RHOMIN then the program checks
      C        to see if the signal is within the specified azimuth range. If so,
      C        the analysis data (and statistics if requested) are printed.  When
      C        the last block (STOP) is read, the average values of the analysis
      C        data are printed.  The program then allows for another scan.
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        DIMENSION IWKSPC(2730),IMPONG(2730)
0004        COMMON /TRAILY/ IMPING(2580),FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FFSPQX,FRHOVX,FVELOX,
```

```
     1      (FAZIMX,FVEVAX,FAZVAX,TVELOC,TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),
     2      (TPSI(4),TRHO(6),ITMAX(4),ITMIN(4),FTSPQX,TRHOVX,TVELOX,TAZIMX,
     3      (TVEVAX,TAZVAX
0005          DIMENSION IHEADR(20),IHEAD1(20)
0006          DIMENSION FSIGMA(4),TSIGMA(4)
0007          EQUIVALENCE (IMPING(1),IMPONG(1))
      C
0008          DATA IZERO/0/,FOUR/1HF/,THREE/1HT/,BOTH/1HB/
0009          DATA XNO/1HN/,YES/1HY/,INO/-1/,IYES/1/,ZERO/0./
0010          DATA IUNIT/00/,IDNSTY/900/,IPARTY/1/,IREV/-1/
      C.....................................................................
      C
      C     Program and mag tape initialization area.
      C
0011    100   TYPE 10
0012          TYPE 193
0013          ACCEPT 19,JYEAR
      C
0014    102   CALL MTINIT(IUNIT)
0015          IF (ISTATU(1) .LT. 0) STOP
      C
0017    110   IGFLAG = INO
0018          ISTATU(8) = INO
0019          TYPE 13
0020          ACCEPT 12,ARRNBR
      C
0021          TYPE 18
0022          ACCEPT 14,RHOMIN
0023          IF (RHOMIN .NE. 0.) GO TO 111
0025          IF (ARRNBR .EQ. THREE) RHOMIN=0.6
0027          IF (ARRNBR .EQ. FOUR) RHOMIN=0.5
0029          IF ((ARRNBR .NE. THREE) .AND. (ARRNBR .NE. FOUR)) GO TO 110
0031    111   TYPE 16
0032          ACCEPT 12,STATS
0033          TYPE 15
0034          ACCEPT 12,ALL
0035          INRDIF = 6
0036          TYPE 171
0037          ACCEPT 19,NRCHNL
0038          IF (NRCHNL .EQ. 3) INRDIF = 3
0040          FNRDIF = FLOAT(INRDIF)
      C.....................................................................
      C
      C     Average values initialization area
      C
0041          TYPE 177
0042          ACCEPT 178, AZMIN,AZMAX
0043          TYPE 179
0044          ACCEPT 178, VELMIN,VELMAX
0045          IF (VELMIN .EQ. 0.) VELMIN=250.
0047          IF (VELMAX .EQ. 0.) VELMAX=700.
0049          TYPE 1791
0050          ACCEPT 178,CVMAX
0051          IF (CVMAX .EQ. 0.) CVMAX=10000.
```

```
0053          PRINT 176,AZMIN,AZMAX,VELMIN,VELMAX,CVMAX
0054          AZMINP=AZMIN
0055          IF (AZMIN.GT.AZMAX) AZMIN=AZMIN-360.
0057          ITNUM=0
0058          IFNUM=0
0059          TSET=0.
0060          FSET=0.
0061          TRT=0.
0062          FRT=0.
0063          TAZT=0.
0064          FAZT=0.
0065          TCZT=0.
0066          FCZT=0.
0067          TVT=0.
0068          FVT=0.
0069          TCVT=0.
0070          FCVT=0.
0071          TDRT=0.
0072          FDRT=0.
0073          TMDRT=0.
0074          FMDRT=0.
      C.....................................................
      C
      C     Tape read and average values calculation area
      C
0075   200    TYPE 190
0076          ACCEPT 19,ISTART,ISTOP
0077          IF (ISTART .EQ. 0) ISTART = 1
0079          IF (ISTOP .EQ. 0) ISTOP = 10000
0081          ISTOPR = ISTOP + 1
      C
0082          DO 243,I = 2581,2730
0083   243    IMPING(I) = 0
      C
0084   201    CALL REDTAP(IUNIT,IMPING,INRBYT,ISTATU)
0085          IF (ISTATU(1) .GT. 0) GO TO 205
0087          CALL MTSTAT(IUNIT)
0088          IF (ISTATU(8) .GT. 0) GO TO 208
0090          GO TO 201
      C
0091   205    IF (IMPING(2) .EQ. ISTART) GO TO 220
0093          IFWD = ISTART - IMPING(2)
0094          IFWD = IFWD - 1
0095          IF (IFWD .EQ. 0) GO TO 201
0097          CALL SPCTAP (IUNIT,IFWD,ISTATU)
0098          IF (ISTATU(1) .LT. 0) CALL MTSTAT(IUNIT)
0100          GO TO 201
      C
0101   220    IF (IMPING(2) .LE. ISTOPR) GO TO 204
      C
0103   208    IHEADR(2)=0
0104          IHEAD1(2)=0
0105          IHBKNR = 0
0106          IF (ARRNBR.EQ.FOUR) GO TO 221
```

```
0108          IF (ITNUM .EQ. 0) GO TO 221
0110          TNUM=FLOAT(ITNUM)
0111          TSET=128./(TSET/TNUM)
0112          TCZT=TCZT/TNUM
0113          TCVT=TCVT/TNUM
0114          TDRT=TDRT/TNUM
0115          TAZT=TAZT/TNUM
0116          IF (TAZT .LT. 0.0) TAZT = TAZT + 360.
0118          TVT=TVT/TNUM
0119          PRINT 175,ITNUM,TSET,TRT,TDRT,TMDRT,TAZT,TCZT,TVT,TCVT
0120    221   IF (ARRNBR.EQ.THREE) GO TO 222
0122          IF (IFNUM .EQ. 0) GO TO 222
0124          FNUM=FLOAT(IFNUM)
0125          FSET=512./(FSET/FNUM)
0126          FCZT=FCZT/FNUM
0127          FCVT=FCVT/FNUM
0128          FDRT=FDRT/FNUM
0129          FAZT=FAZT/FNUM
0130          IF (FAZT .LT. 0.0) FAZT = FAZT + 360.
0132          FVT=FVT/FNUM
0133          PRINT 175,IFNUM,FSET,FRT,FDRT,FMDRT,FAZT,FCZT,FVT,FCVT
              C
0134    222   PAUSE ' ***DONE***'
              C
0135          TYPE 151
0136          ACCEPT 12, BEYOND
0137          IF (BEYOND .EQ. YES) GO TO 110
0139          TYPE 150
0140          ACCEPT 12, REWIND
0141          IF (REWIND .NE. YES) CALL EXIT
0143          CALL REWTAP (IUNIT,ISTATU)
0144          IF (ISTATU(1) .LT. 0) CALL MTSTAT(IUNIT)
0146          GO TO 110
              C
0147    204   CALL REDTAP(IUNIT,IWKSPC,INRBYT,ISTATU)
0148          IF (ISTATU(1) .GT. 0) GO TO 211
0150          CALL MTSTAT(IUNIT)
0151          IF (ISTATU(8) .GT. 0) GO TO 208
0153          GO TO 204
              C
0154    211   IF (IWKSPC(2) .NE. IMPING(2)) GO TO 214
0156          IF (IWKSPC(4) .NE. IMPING(4)) GO TO 214
0158          IF (ALL .EQ. YES) TYPE 17,IMPING(2)
              C
0160    209   DO 217,I = 1,2730
0161    217   IMPING(I) = IWKSPC(I)
0162          IGFLAG = INO
0163          GO TO 204
              C
0164    214   IGFLAG = IYES
0165          IF (IMPING(2) .GT. ISTOPR) GO TO 208
              C.....................................................................
              C
              C     Tape block setup area
```

```
      C
0167   300  DO 301,I = 1,20
0168        IHEADR(I) = IHEAD1(I)
0169   301  IHEAD1(I) = IMPING(I)
0170        IF (IHEADR(16) .GT. 0) IHBKNR = IHEADR(2) - 1
0172        IF (IHEADR(2) .LT. ISTART) GO TO 209
      C
0174   349  FRHOVG = 0.
0175        DO 302,I = 1,INRDIF
0176   302  FRHOVG = FRHOVG + FRHO(I)
0177        FRHOVG = FRHOVG/FNRDIF
      C
0178        DO 304,I = 1,4
0179        FSIGMA(I) = FPSI(I)**2 - FMU(I)**2
0180        IF (FSIGMA(I) .LT. 0.) FSIGMA(I) = 0.
0182   304  FSIGMA(I) = SQRT(FSIGMA(I))
      C
0183        TRHOVG = 0.
0184        DO 303,I = 1,4
0185        TSIGMA(I) = TPSI(I)**2 - TMU(I)**2
0186        IF (TSIGMA(I) .LT. 0.) TSIGMA(I) = 0.
0188   303  TSIGMA(I) = SQRT(TSIGMA(I))
      C
0189        DO 305,I = 1,INRDIF
0190   305  TRHOVG = TRHOVG + TRHO(I)
0191        TRHOVG = TRHOVG/FNRDIF
0192        TRODIF = TRHOVX - TRHOVG
0193        FRODIF = FRHOVX - FRHOVG
0194        IF (ARRNBR .EQ. FOUR) GO TO 605
      C.....................................................................
      C
      C     T array signal detection area
      C
0196        IF (TRHOVG .LT. RHOMIN) GO TO 605
0198        IF (TVELOX .LT. VELMIN) GO TO 605
0200        IF (TVELOX .GT. VELMAX) GO TO 605
0202        IF (TVEVAX .GT. CVMAX) GO TO 605
0204        TAZIMY=TAZIMX
0205        IF ((AZMIN.LT.0.).AND.(TAZIMX.GT.AZMINP)) TAZIMY=TAZIMX-360.
0207        IF ((TAZIMY.LT.AZMIN).OR.(TAZIMY.GT.AZMAX)) GO TO 605
      C
0209        IIBKNR = IHEADR(2)
0210        JDAY = IHEADR(3)
0211        JHOUR = IHEADR(4)
0212        JSEC = IHEADR(5)
0213        IERRTO = IHEADR(17)
0214        IZERON = IHEADR(18)
0215        IOVRNG = IHEADR(19)
0216        IUNDRN = IHEADR(20)
0217        JFLAG = IZERO
0218        CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0219        IPFLAG = INO
      C
0220        IF (ALL .EQ. YES) GO TO 651
```

```
0222          IF (IHEADR(2) .EQ. ISTART) GO TO 651
0224          IF (IHEADR(2) .EQ. ISTOP) GO TO 651
0226          GO TO 653
0227    651   IF (STATS .NE. YES) GO TO 610
      C
0229          PRINT 197,IIBKNR,IERRTO,IZERON,IOVRNG,IUNDRN
0230          IF (ITSTAT - 0) 601,604,606
0231    601   PRINT 180,THREE
0232          GO TO 604
0233    606   PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0234          IPFLAG = IYES
0235          PRINT 183,IHEADR(2),ZERO,TAZVAR,TVEVAR,TAZIMF,TVELOC,TRHOVG,TRODIF
0236    604   PRINT 181,THREE,TRHO
0237          DO 611,I = 1,4
0238          III=I+3
0239    611   PRINT 185,III,ITMAX(I),ITMIN(I),TMU(I),TPSI(I),TSIGMA(I)
      C
0240    610   IF ((STATS .NE. YES).AND.(TRODIF.LT.0.)) GO TO 605
0242          IF (FTSPQX - 0.) 612,613,614
0243    612   PRINT 192,THREE
0244          GO TO 605
0245    613   PRINT 190
0246          GO TO 605
0247    614   IF (IPFLAG .LT. 0) PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0249    630   PRINT 183,IHEADR(2),FTSPQX,TAZVAX,TVEVAX,TAZIMX,TVELOX,
     &          TRHOVX,TRODIF
      C
0250    653   ITNUM=ITNUM+1
0251          TSET=TSET+120./FTSPQX
0252          TCZT=TCZT+TAZVAX
0253          TCVT=TCVT+TVEVAX
0254          TDRT=TDRT+TRODIF
0255          TAZT=TAZT+TAZIMY
0256          TVT=TVT+TVELOX
0257          IF (TRT.LT.TRHOVX) TRT=TRHOVX
0259          IF (TMDRT.LT.TRODIF) TMDRT=TRODIF
      C
0261    605   IF (ARRNBR .EQ. THREE) GO TO 209
      C.....................................................................
      C
      C       F array signal detection area
      C
0263          IDUM = IHEADR(2) - 3
0264          IF (IDUM .LE. IHBKNR) GO TO 209
0266          IF (FRHOVG .LT. RHOMIN) GO TO 209
0268          IF (FVELOX .LT. VELMIN) GO TO 209
0270          IF (FVELOX .GT. VELMAX) GO TO 209
0272          IF (FVEVAX .GT. CVMAX) GO TO 209
0274          FAZIMY=FAZIMX
0275          IF ((AZMIN.LT.0).AND.(FAZIMX.GT.AZMINP)) FAZIMY=FAZIMX-360.
0277          IF ((FAZIMY.LT.AZMIN).OR.(FAZIMY.GT.AZMAX)) GO TO 209
      C
0279          IIBKNR = IHEADR(2)
0280          JDAY = IHEADR(3)
```

```
0281          JHOUR = IHEADR(4)
0282          JSEC = IHEADR(5)
0283          IERRTO = IHEADR(17)
0284          IZERON = IHEADR(18)
0285          IOVRNG = IHEADR(19)
0286          IUNDRN = IHEADR(20)
0287          JFLAG = IZERO
0288          CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0289          IPFLAG = INO
      C
0290          IF (ALL .EQ. YES) GO TO 654
0292          IF (IHEADR(2) .EQ. ISTART) GO TO 654
0294          IF (IHEADR(2) .EQ. ISTOP) GO TO 654
0296          GO TO 656
0297    654   IF (STATS .NE. YES) GO TO 615
      C
0299          PRINT 197,IIBKNR,IERRTO,IZERON,IOVRNG,IUNDRN
0300    632   IF (IFSTAT - 0) 607,602,608
0301    607   PRINT 180,FOUR
0302          GO TO 602
0303    608   PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0304          IPFLAG = IYES
0305    631   PRINT 182,IDUM,IHEADR(2),ZERO,FAZVAR,FVEVAR,FAZIMF,
             &     FVELOC,FRHOVG,FRODIF
0306    602   PRINT 181,FOUR,FRHO
0307          DO 616,I = 1,4
0308          III=I-1
0309    616   PRINT 185,III,IFMAX(I),IFMIN(I),FMU(I),FPSI(I),FSIGMA(I)
      C
0310    615   IF ((STATS .NE. YES).AND.(FRODIF.LT.0.)) GO TO 209
0312          IF (FFSPQX - 0) 617,618,619
0313    617   PRINT 192,FOUR
0314          GO TO 209
0315    618   PRINT 180,FOUR
0316          GO TO 209
0317    619   IF (IPFLAG .LT. 0) PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0319          PRINT 182,IDUM,IHEADR(2),FFSPQX,FAZVAX,FVEVAX,FAZIMX,
             &     FVELOX,FRHOVX,FRODIF
0320    656   IFNUM=IFNUM+1
0321          FSET=FSET+512./FFSPQX
0322          FCZT=FCZT+FAZVAX
0323          FCVT=FCVT+FVEVAX
0324          FDRT=FDRT+FRODIF
0325          FAZT=FAZT+FAZIMY
0326          FVT=FVT+FVELOX
0327          IF (FRT.LT.FRHOVX) FRT=FRHOVX
0329          IF (FMDRT.LT.FRODIF) FMDRT=FRODIF
0331          GO TO 209
      C.....................................................................
      C
      C     FORMATs area
      C
0332    10    FORMAT (/,' AZSCAN Rev 11.3')
0333    12    FORMAT (A1)
```

```
0334     13  FORMAT (' F,T or B? ',$)
0335     14  FORMAT (F6.2)
0336     15  FORMAT (' All? ',$)
0337     150 FORMAT (' Rewind tape ?  (otherwise EXIT!) ',$)
0338     151 FORMAT (' Continue in this file on tape? ',$)
0339     16  FORMAT (' Statistics? ',$)
0340     17  FORMAT (' BAD Block, #',I5)
0341     171 FORMAT (' Number of channels? ',$)
0342     175 FORMAT (' ',I4,'SIG  SE',F5.1,3X,'MAXR',F4.2,2X,'AVDR',F4.2,2X,
            &    'MAXDR',F4.2,3X,'AZ',F4.0,'  CZ',F4.0,3X,'V',F4.0,'  CV',F4.0)
0343     176 FORMAT (///,' Azimuth Min:',F5.0,' Max:',F5.0,
            &           /,' Velocity Min:',F5.0,' Max:',F5.0/' CVMAX:',F8.1)
0344     177 FORMAT (' Azimuth MIN,MAX: '$)
0345     178 FORMAT (2F6.2)
0346     179 FORMAT (' Velocity MIN,MAX: '$)
0347    1791 FORMAT (' CVMAX? ',$)
0348     18  FORMAT (' Minimum RHO? ',$)
0349     180 FORMAT (' ',A1,3X,'***INVALID ANALYSIS!!***')
0350     181 FORMAT (' ',A1,3X,6F5.2)
0351     182 FORMAT (' F',I5,' to',I5,12X,F5.1,2F6.0,2F8.0,4X,
            &    '(',F4.2,')',F6.2)
0352     183 FORMAT (' T',I5,20X,F5.1,2F6.0,2F7.0,6X,'(',F4.2,')',F6.2)
0353     185 FORMAT (' ',I1,2I6,3F7.1)
0354     19  FORMAT (2I6)
0355     190 FORMAT (' Start,Stop: ',$)
0356     192 FORMAT (' ',A1,3X,'***INVALID FILTER!!***')
0357     193 FORMAT (' Year? ',$)
0358     197 FORMAT ('0#',5I6)
0359     198 FORMAT (' @ WBA',I3,'-',A3,'-',I2,I4,' :',I2,' ',I2,'"UT.')
         C.....................................................................
         C
0360     500 STOP
0361         END
```

```
                                ;************** CLEAR.MAC ****************************************
                                ;
                                        .TITLE CLEAR
                                ;
                                ;       DATE OF REVISION: 7-APR-84
                                ;
                                ;       PURPOSE
                                ;          TO CLEAR GRAPHICS AND ALPHANUMERIC DATA FROM THE SCREEN AND
                                ;          RETURN THE TERMINAL TO THE ADM-3A MODE.
                                ;
                                ;       USAGE
                                ;          R CLEAR
                                ;
                                        .MCALL  .PRINT,.EXIT
000000                          CLEAR:  .PRINT  #BUFF                   ;SEND CONTROL CHARACTERS
000006                                  .EXIT
000010  037     035     067     BUFF:   .BYTE   37,35,67,177,40,100,37,33,14,30,0
000013  177     040     100
000016  037     033     014
000021  030     000
                                        .EVEN
000000'                                 .END    CLEAR
```

LPINIT

```
                        ;************ LPINIT.MAC ****************************************
                        ;
                        ;       DATE OF REVISION: 7-APR-84
                        ;
                                .TITLE  LPINIT
                        ;
                        ;       PURPOSE
                        ;           TO INITIALIZE THE LINE PRINTER
                        ;
                        ;       USAGE
                        ;           R LPINIT
                        ;
                        ;       INPUT PARAMETERS
                        ;           NONE
                        ;
                        ;       REMARKS
                        ;           THE LINE PRINTER IS INITIALIZED SUCH THAT IT IS AT THE TOP
                        ;           OF FORM, PRINTING SIX LINES PER INCH AND TWELVE CHARACTERS
                        ;           PER INCH, WITH A ONE INCH LEFT MARGIN AND A ONE INCH SKIP
                        ;           OVER THE PERFORATION.  BE SURE THAT THE PAPER IS SET AT THE
                        ;           TOP OF FORM BEFORE RUNNING LPINIT.  THIS CONFIGURATION WILL
                        ;           ALLOW 84 CHARACTERS TO BE PRINTED ON ONE LINE.
                        ;
                        ;       METHOD
                        ;           THE APPROPRIATE CONTROL CHARACTERS AND ESCAPE SEQUENCES ARE
                        ;           PASSED TO THE PRINTER
                        ;
                                .MCALL  .CLOSE,.ENTER..EXIT,.FETCH,.PRINT,.WRITW
000000  012705  000120'    LPINIT: MOV     #LPNAME,R5              ;GET DEVICE NAME
000004                            .FETCH  #HSPACE,R5              ;GET DEVICE HANDLER
000014  103443                    BCS     FERR                    ;BRANCH IF ERROR
000016  012704  000200'           MOV     #AREA,R4                ;GET ARGUMENT BLOCK
000022  012703  000001            MOV     #1,R3                   ;GET CHANNEL NUMBER
000026                            .ENTER  R4,R3,R5                ;OPEN CHANNEL
000044  103427                    BCS     FERR                    ;BRANCH IF ERROR
000046                            .WRITW  R4,R3,#BUFF,#5,R3       ;OUTPUT CONTROL CODES
000104  103413                    BCS     WERR                    ;BRANCH IF ERROR
000106                            .CLOSE  R3                      ;CLOSE CHANNEL
000116                            .EXIT
000120  046600            LPNAME: .RAD50  /LP /                   ;DEVICE NAME
000122  000000                    .WORD   0
000124                    FERR:   .PRINT  #FMSG                   ;SEND ERROR MESSAGE
000132                            .EXIT
000134                    WERR:   .PRINT  #WMSG                   ;SEND ERROR MESSAGE
000142                            .EXIT
000144    033     100     033     BUFF:   .BYTE   33,100,33,115,33,116,6,33,154,14
000147    115     033     116
000152    006     033     154
000155    014
000156    077     114     120     FMSG:   .ASCIZ  /?LP.SYS?/
000161    056     123     131
000164    123     077     000
000167    077     127     122     WMSG:   .ASCIZ  /?WRITE?/
000172    111     124     105
000175    077     000
                                .EVEN
000200                    AREA:   .BLKW   10                      ;ARGUMENT BLOCK
```

LPINIT

```
51        000220'                HSPACE=.
52        000000'                       .END    LPINIT
```

```
                                ;************ LP16.MAC ****************************************
                                ;
                                ;       DATE OF REVISION: 28-MAY-84
                                ;
                                        .TITLE  LP16
                                ;
                                ;       PURPOSE
                                ;           TO  SET UP THE LINE PRINTER FOR 16CPI PRINTING
                                ;
                                ;       USAGE
                                ;           R LP16
                                ;
                                ;       INPUT PARAMETERS
                                ;           NONE
                                ;
                                ;       REMARKS
                                ;           THE LINE PRINTER IS INITIALIZED SUCH THAT IT IS AT THE TOP
                                ;           OF FORM, PRINTING SIX LINES PER INCH AND SIXTEEN CHARACTERS
                                ;           PER INCH, WITH A ONE INCH LEFT MARGIN.  BE SURE THAT THE
                                ;           PAPER IS SET AT THE TOP OF FORM BEFORE RUNNING LP16.  THIS
                                ;           CONFIGURATION WILL ALLOW 120 CHARACTERS TO BE PRINTED ON
                                ;           ONE LINE.
                                ;
                                ;       METHOD
                                ;           THE APPROPRIATE CONTROL CHARACTERS AND ESCAPE SEQUENCES ARE
                                ;           PASSED TO THE PRINTER
                                ;
                                        .MCALL  .CLOSE,.ENTER,.EXIT,.FETCH,.PRINT,.WRITW
000000  012705  000120'        LP16:   MOV     #LPNAME,R5              ;GET DEVICE NAME
000004                                  .FETCH  #HSPACE,R5              ;GET DEVICE HANDLER
000014  103443                          BCS     FERR                    ;BRANCH IF ERROR
000016  012704  000174'                 MOV     #AREA,R4                ;GET ARGUMENT BLOCK
000022  012703  000001                  MOV     #1,R3                   ;GET CHANNEL NUMBER
000026                                  .ENTER  R4,R3,R5                ;OPEN CHANNEL
000044  103427                          BCS     FERR                    ;BRANCH IF ERROR
000046                                  .WRITW  R4,R3,#BUFF,#3,R3       ;OUTPUT CONTROL CODES
000104  103413                          BCS     WERR                    ;BRANCH IF ERROR
000106                                  .CLOSE  R3                      ;CLOSE CHANNEL
000116                                  .EXIT
000120  046600                  LPNAME: .RAD50  /LP /                   ;DEVICE NAME
000122  000000                          .WORD   0
000124                          FERR:   .PRINT  #FMSG                   ;SEND ERROR MESSAGE
000132                                  .EXIT
000134                          WERR:   .PRINT  #WMSG                   ;SEND ERROR MESSAGE
000142                                  .EXIT
000144    033     100     017   BUFF:   .BYTE   33,100,17,33,154,20
000147    033     154     020
000152    077     114     120   FMSG:   .ASCIZ  /?LP.SYS?/
000155    056     123     131
000160    123     077     000
000163    077     127     122   WMSG:   .ASCIZ  /?WRITE?/
000166    111     124     105
000171    077     000
                                        .EVEN
000174                          AREA:   .BLKW   10                      ;ARGUMENT BLOCK
        000214'                 HSPACE=.
        000000'                         .END    LP16
```

```
      C************** MTINIT.FOR ****************************************
      C
      C     Date of revision: 19-May-84
      C
0001        SUBROUTINE MTINIT(IUNIT)
      C
      C     PURPOSE
      C       To initialize the tape transport
      C
      C     USAGE
      C       CALL MTINIT(IUNIT)
      C
      C     DESCRIPTION OF PARAMETERS
      C       IUNIT  - The tape drive to be initialized (usually 0)
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        DATA YES/1HY/
0004        GO TO 20
0005     10 PAUSE ' INITAP failed to initialize!  <CR>'
0006     20 CALL INITAP (IUNIT,IDNSTY,IPARTY,ISTATU)
0007        IF (ISTATU(1) .LT. 0) TYPE 111
0009        IF (ISTATU(1) .LT. 0) GO TO 10
0011        IF (ISTATU(2) .GT. 0) GO TO 30
0013        IF (ISTATU(3) .LT. 0) TYPE 112
0015        IF (ISTATU(3) .LT. 0) GO TO 10
0017        TYPE 113
0018     30 IF (ISTATU(2) .GT. 0) TYPE 114
0020        IF (ISTATU(4) .GT. 0) GO TO 40
0022        TYPE 115
0023        IF (ISTATU(5) .GT. 0) TYPE 116
0025        GO TO 10
0026     40 TYPE 117
0027        IF (ISTATU(6) .GT. 0) TYPE 118
0029        IF (ISTATU(6) .LT. 0) TYPE 119
0031        ACCEPT 120, ANSWER
0032        IF (ANSWER .EQ. YES) GO TO 20
0034        IF (ISTATU(6) .GT. 0) RETURN
0036        TYPE 121
0037        ACCEPT 120, ANSWER
0038        IF (ANSWER .NE. YES) RETURN
0040     50 CALL EOFTAP (IUNIT,ISTATU)
0041        IF (ISTATU(1) .GT. 0) GO TO 60
0043        TYPE 122
0044        CALL MTSTAT(IUNIT)
0045        RETURN
0046     60 TYPE 123
0047        ACCEPT 120, ANSWER
0048        IF (ANSWER .EQ. YES) GO TO 50
0050        RETURN
      C
      C FORMATs area
      C
0051     111 FORMAT (' ERROR on INITAP return (CALL arguments)!',$)
0052     112 FORMAT (' Tape unit is NOT ON LINE!',$)
```

```
0053     113 FORMAT (' Tape unit is ON LINE but tape is NOT at BOT!',$)
0054     114 FORMAT (' Tape unit is ON LINE and tape is at BOT!',$)
0055     115 FORMAT (' Tape unit is NOT ready!',$)
0056     116 FORMAT (' Tape is rewinding (or loading forward)!',$)
0057     117 FORMAT (' Tape unit is ready!',$)
0058     118 FORMAT (' Tape is WRITE PROTECTED (ring is OUT)-do you want to rei
            $nitialize ? <Y or N> ',$)
0059     119 FORMAT (' Tape is NOT write protected (ring is IN)-do you want to
            $reinitialize? <Y or N> ',$)
0060     120 FORMAT (A1)
0061     121 FORMAT (' Do you want an immediate EOF (end of file) to precede th
            $e data?  <Y or N> ',$)
0062     122 FORMAT (' ERROR on EOFTAP return!',$)
0063     123 FORMAT (' Do you want another EOF on this tape? <Y or N> ',$)
0064         END
```

```
      C************  MTSTAT.FOR  ****************************************
      C
      C     Date of revision: 19-May-84
      C
0001        SUBROUTINE MTSTAT(IUNIT)
      C
      C     PURPOSE
      C       To determine the error status of the tape transport
      C
      C     USAGE
      C       CALL MTSTAT(IUNIT)
      C
      C     DESCRIPTION OF PARAMETERS
      C       IUNIT  - The tape transport whose status is to be determined
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        DATA YES/1HY/
0004        CALL STATAP (IUNIT,ISTATU)
0005        IF (ISTATU(8) .GT. 0) GO TO 30
0007        IF (ISTATU(1) .GT. 0) GO TO 10
0009        IF (ISTATU(2) .GT. 0) TYPE 111
0011        IF (ISTATU(3) .GT. 0) TYPE 112
0013        IF (ISTATU(4) .GT. 0) TYPE 113
0015        IF (ISTATU(5) .GT. 0) TYPE 114
0017        IF (ISTATU(6) .GT. 0) TYPE 115
0019        IF (ISTATU(7) .GT. 0) TYPE 116
0021        TYPE 117, (ISTATU(K), K=9,12)
0022        RETURN
0023     10 ISTATU(1) = INO
0024        TYPE 118
0025        TYPE 119, ISTATU(2)
0026        IF (ISTATU(3) .GT. 0) GO TO 20
0028        TYPE 120
0029        RETURN
0030     20 IF (ISTATU(4) .LT. 0) TYPE 121
0032        RETURN
0033     30 TYPE 122
0034        ISTATU(1) = IYES
0035        RETURN
0036    111 FORMAT (' NXM bit set: no memory response!',$)
0037    112 FORMAT (' BTE bit set: character during gap shut down!',$)
0038    113 FORMAT (' RLE bit set: tape record is longer than specified!',$)
0039    114 FORMAT (' EOT bit set: end of tape encountered!',$)
0040    115 FORMAT (' BGL bit set: BUS too slow responding!',$)
0041    116 FORMAT (' PAE bit set: UNABLE to recover parity error!',$)
0042    117 FORMAT (' The following OCTAL values are given to aid in trouble a
           $nalysis,',/,'   MTS = ',O6,/,'   MTC = ',O6,/,' MTBRC = ',O6,
           $/,' MTCMA = ',O6,$)
0043    118 FORMAT (' ILLC bit set: ILLEGAL command-here is why:',$)
0044    119 FORMAT (' MTC = ',O6,' (OCTAL)',$)
0045    120 FORMAT (' SELR = INO: tape unit is NOT ON LINE!',$)
0046    121 FORMAT (' CURD = INO: control unit is NOT ready!',$)
0047    122 FORMAT (' EOF (end-of-file) encountered!',$)
0048        END
```

REWIND

```
                        ;************ REWIND.MAC ***********************************************
                        ;
                              .TITLE REWIND
                        ;
                        ;     DATE OF REVISION: 7-APR-84
                        ;
                        ;     PURPOSE
                        ;        TO REWIND THE TAPE ON UNIT MT0:
                        ;
                        ;     USAGE
                        ;        R REWIND
                        ;
                              .MCALL  .EXIT,.PRINT
            160000            DRVSTA = 160000
                                 REW = 16
                                 MTC = 172522
000000  012767  160000  172522 REWIND: MOV     #DRVSTA,MTC          ;SET UP UNIT 0
000006  112767  000016  172522         MOVB    #REW,MTC             ;SET UP TO REWIND
000014  105767  172522                 TSTB    MTC                  ;IS MTC READY FOR COMMAND?
000020  100375                        BPL     .-4                  ;NO
000022  005267  172522                 INC     MTC                  ;YES, GO TAPE
000026  105767  172522                 TSTB    MTC                  ;DONE YET?
000032  100375                        BPL     .-4                  ;NO
000034  005767  172522                 TST     MTC                  ;YES, TEST FOR ERROR RETURN
000040  100401                        BMI     1$
000042                                 .EXIT
000044                           1$:   .PRINT  #MSG                 ;SEND ERROR MESSAGE
000052                                 .EXIT
000054    077     122     105  MSG:    .ASCIZ  /?REWIND ERROR?/
000057    127     111     116
000062    104     040     105
000065    122     122     117
000070    122     077     000
                        ;
                                 .EVEN
            000000'              .END    REWIND
```

```
      C************  RPTSCN.FOR  ********************************************
      C
      C     Date of revision: 10-Oct-84
      C
0001        PROGRAM RPTSCN
      C
      C     PURPOSE
      C        To scan a tape for blocks of interest, and produce an output in
      C        the form of a data message
      C
      C     USAGE
      C        RUN RPTSCN
      C
      C     INPUT PARAMETERS
      C        YEAR    - A two digit integer
      C        JULIAN  - A three digit integer julian day
      C        MONTH   - A three letter month abbreviation
      C        DATE    - A two digit integer date of month
      C        TIME    - A four digit integer
      C        SERIAL  - A four digit integer (5000 < SERIAL < 5099)
      C        INF NR  - A four digit integer
      C        F,T,B   - Selects F array, T array, or Both arrays
      C        RHOMIN  - Minimum average PREfiltered correlation coefficient for
      C                  blocks of interest (default 0.6 if T, 0.5 if F)
      C        NRCHNL  - Number of channels in array (default 4)
      C        SKIP PARAMS - Parameters of blocks selected by AZSCAN that are
      C                  not to be listed individually in the report
      C           START  - Integer value of first block from AZSCAN
      C           STOP   - Integer value of last block from AZSCAN
      C           AZMIN  - Real value of minimum azimuth from AZSCAN
      C           AZMAX  - Real value of maximum azimuth from AZSCAN
      C           VELMIN - Real value of minimum velocity from AZSCAN
      C           VELMAX - Real value of maximum velocity from AZSCAN
      C        START   - Integer value of first block to be scanned
      C        STOP    - Integer value of last block to be scanned
      C        BEYOND  - If Y is entered, another scan is permitted
      C        REWIND  - If Y is entered, tape is rewound and another scan is
      C                  permitted
      C
      C     REMARKS
      C        To prepare a data message, first the T array should be scanned,
      C        then the F array should be scanned.  The resulting file should be
      C        appropriately edited and then one tape and two text copies should
      C        be made.  The tape and one text copy should be delivered to COMS.
      C
      C     LIBRARIES REQUIRED
      C        REDLIB,MACLIB
      C
      C     METHOD
      C        The program is similiar to SCAN and AZSCAN except for output
      C        format.  The output is written to logical unit 19.
      C
0002        COMMON IBKBEG(20),IBKFIN(20),AZMIN(20),AZMAX(20)
0003        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
```

```
0004          DIMENSION VELMIN(20),VELMAX(20),IWKSPC(2730),IMPONG(2730)
0005          COMMON /TRAILY/ IMPING(2580),FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
             (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FFSPQX,FRHOVX,FVELOX,
             (FAZIMX,FVEVAX,FAZVAX,TVELOC,TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),
             (TPSI(4),TRHO(6),ITMAX(4),ITMIN(4),FTSPQX,TRHOVX,TVELOX,TAZIMX,
             (TVEVAX,TAZVAX
0006          DIMENSION IHEADR(20),IHEAD1(20)
0007          DIMENSION FSIGMA(4),TSIGMA(4)
0008          LOGICAL*1 ICHAR(80),ICHRCR,ICHRBK,ICHRLF,ICR
0009          EQUIVALENCE (IMPING(1),IMPONG(1))
      C
0010          DATA ICHRCR/"137/,ICHRBK/"45/,ICHRLF/"12/,ICR/"15/
0011          DATA IZERO/0/,FOUR/1HF/,THREE/1HT/,BOTH/1HB/,LINCNT/80/
0012          DATA XNO/1HN/,YES/1HY/,INO/-1/,IYES/1/,ILINE/1/
0013          DATA IUNIT/00/,IDNSTY/800/,IPARTY/1/,IREV/-1/,IILINE/0/
      C.....................................................................
      C
      C       Program and mag tape initialization area.
      C
0014    100   TYPE 10
0015          TYPE 193
0016          ACCEPT 19,JYEAR
0017          TYPE 172
0018          ACCEPT 19,JULIAN
0019          TYPE 173
0020          ACCEPT 191,BMONTH
0021          TYPE 174
0022          ACCEPT 19,MDATE
0023          TYPE 175
0024          ACCEPT 19,MTIME
0025          TYPE 176
0026          ACCEPT 19,NRSER
0027          TYPE 177
0028          ACCEPT 19,INFNR
      C
0029    102   CALL MTINIT(IUNIT)
0030          IF (ISTATU(1) .NE. IYES) STOP
      C
0032          PAUSE ' Insert message disk'
0033          WRITE (19,180) ICR
0034          IF (MTIME .LT. 1000) GO TO 104
0036          IF (JULIAN .GE. 100) WRITE (19,2181) NRSER,JULIAN,MTIME,ICR
0038          IF (JULIAN .GE. 100) GO TO 103
0040          IF (JULIAN .GE. 10) WRITE (19,2281) NRSER,JULIAN,MTIME,ICR
0042          IF (JULIAN .GE. 10) GO TO 103
0044          WRITE (19,2381) NRSER,JULIAN,MTIME,ICR
0045    103   IF (MDATE .GE. 10)
             &    WRITE (19,2189) ICR,MDATE,MTIME,BMONTH,JYEAR,ICR
0047          IF (MDATE .LT. 10)
             &    WRITE (19,2289) ICR,MDATE,MTIME,BMONTH,JYEAR,ICR
0049          GO TO 106
0050    104   IF (JULIAN .GE. 100) WRITE (19,2481) NRSER,JULIAN,MTIME,ICR
0052          IF (JULIAN .GE. 100) GO TO 105
0054          IF (JULIAN .GE. 10) WRITE (19,2581) NRSER,JULIAN,MTIME,ICR
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0056          IF (JULIAN .GE. 10) GO TO 105
0058          WRITE (19,2681) NRSER,JULIAN,MTIME,ICR
0059      105 IF (MDATE .GE. 10)
             &    WRITE (19,2389) ICR,MDATE,MTIME,BMONTH,JYEAR,ICR
0061          IF (MDATE .LT. 10)
             &    WRITE (19,2489) ICR,MDATE,MTIME,BMONTH,JYEAR,ICR
0063      106 WRITE (19,182) ICR,ICR
0064          WRITE (19,183) ICR,ICR,JYEAR,INFNR,ICR,ICR
0065          WRITE (19,184) JYEAR,INFNR,ICR
      C
0066      110 IGFLAG = INO
0067          TYPE 13
0068          ACCEPT 12,ARRNBR
      C
0069          TYPE 18
0070          ACCEPT 14,RHOMIN
0071          IF (RHOMIN .NE. 0.) GO TO 111
0073          IF (ARRNBR .EQ. THREE) RHOMIN=0.6
0075          IF (ARRNBR .EQ. FOUR) RHOMIN=0.5
0077          IF ((ARRNBR .NE. THREE) .AND. (ARRNBR .NE. FOUR)) GO TO 110
0079      111 INRDIF = 6
0080          TYPE 171
0081          ACCEPT 19,NRCHNL
0082          IF (NRCHNL .EQ. 3) INRDIF = 3
0084          FNRDIF = FLOAT(INRDIF)
      C
0085          KSKIP = -1
0086      115 KSKIP = KSKIP + 1
0087          I = KSKIP + 1
0088          ILINE = ILINE + 1
0089          TYPE 16
0090          ACCEPT 161,IBKBEG(I),IBKFIN(I),AZMIN(I),AZMAX(I),
             &                  VELMIN(I),VELMAX(I)
0091          IF (VELMIN(I) .EQ. 0.) VELMIN(I)=250.
0093          IF (VELMAX(I) .EQ. 0.) VELMAX(I)=700.
0095          IF (IBKBEG(I) .NE. 0) GO TO 115
0097          ILINE = ILINE - 1
      C
      C.....................................................................
      C
      C     Tape read area
      C
0098      200 TYPE 190
0099          ACCEPT 19,ISTART,ISTOP
0100          IISTRT=1
0101          IF (ARRNBR .NE. THREE) IISTRT=4
0103          IF (ISTART .EQ. 0) ISTART = IISTRT
0105          IF (ISTOP .EQ. 0) ISTOP = 10000
0107          ISTOP = ISTOP + 1
      C
0108          DO 243,I = 2581,2730
0109      243 IMPING(I)=0
      C
0110      209 IF (IGFLAG .EQ. IYES) GO TO 201
```

```
0112          CALL REDTAP(IUNIT,IMPING,INRBYT,ISTATU)
0113          IF (ISTATU(1) .EQ. IYES) GO TO 205
0115          CALL MTSTAT(IUNIT)
0116          IF (ARRNBR .EQ. THREE) GO TO 202
0118          IF (ISTATU(8) .EQ. IYES) ILINE = ILINE + 1
0120    202   IF (ISTATU(8) .EQ. IYES) GO TO 208
0122          GO TO 209
      C
0123    205   IF (IMPING(2) .EQ. ISTART) GO TO 220
0125          IFWD = ISTART - IMPING(2)
0126          IFWD = IFWD - 1
0127          IF (IFWD .EQ. 0) GO TO 209
0129          CALL SPCTAP (IUNIT,IFWD,ISTATU)
0130          IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0132          GO TO 209
      C
0133    220   IF (IMPING(2) .LE. ISTOP) GO TO 204
      C
0135    208   PAUSE ' *** DONE, <CR> to continue *** DO NOT <CTRL C> ***'
0136          IHEADR(2) = 0
0137          IHEAD1(2) = 0
0138          IHBKNR = 0
      C
0139          TYPE 151
0140          ACCEPT 12, BEYOND
0141          IF (BEYOND .EQ. YES) GO TO 110
0143          TYPE 15
0144          ACCEPT 12, REWIND
0145          IF (REWIND .NE. YES) GO TO 700
0147          CALL REWTAP (IUNIT,ISTATU)
0148          IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0150          GO TO 110
      C
0151    204   CALL REDTAP(IUNIT,IWKSPC,INRBYT,ISTATU)
0152          IF (ISTATU(1) .EQ. IYES) GO TO 211
0154          CALL MTSTAT(IUNIT)
0155          IF (ARRNBR .EQ. THREE) GO TO 206
0157          IF (ISTATU(8) .EQ. IYES) ILINE = ILINE + 1
0159    206   IF (ISTATU(8) .EQ. IYES) GO TO 208
0161          GO TO 204
      C
0162    211   IF (IWKSPC(2) .NE. IMPING(2)) GO TO 214
0164          IF (IWKSPC(4) .NE. IMPING(4)) GO TO 214
      C
0166    201   DO 217,I = 1,2730
0167    217   IMPING(I) = IWKSPC(I)
0168          IGFLAG = INO
0169          GO TO 204
      C
0170    214   IGFLAG = IYES
0171          IF (IMPING(2) .GT. ISTOP) GO TO 208
      C.....................................................................
      C
      C     Tape block setup area
```

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      C
0173   300  DO 301,I = 1,20
0174        IHEADR(I) = IHEAD1(I)
0175   301  IHEAD1(I) = IMPING(I)
0176    .   IF (IHEADR(16) .EQ. IYES) IHBKNR = IHEADR(2) - 1
      C
0178        FRHOVG = 0.
0179        DO 302,I = 1,INRDIF
0180   302  FRHOVG = FRHOVG + FRHO(I)
0181        FRHOVG = FRHOVG/FNRDIF
      C
0182        TRHOVG = 0.
0183        DO 303,I = 1,INRDIF
0184   303  TRHOVG = TRHOVG + TRHO(I)
0185        TRHOVG = TRHOVG/FNRDIF
0186        TRODIF = TRHOVX - TRHOVG
0187        FRODIF = FRHOVX - FRHOVG
      C
0188        IF (IHEADR(2) .GE. ISTART) GO TO 600
0190        GO TO 209
      C.....................................................................
      C
      C     T array signal detection area
      C
0191   600  IF (TRHOVG .GE. RHOMIN) GO TO 602
0193        IF (FRHOVG .GE. RHOMIN) GO TO 602
0195        GO TO 209
      C
0196   602  IIBKNR = IHEADR(2)
0197        JDAY = IHEADR(3)
0198        JHOUR = IHEADR(4)
0199        JSEC = IHEADR(5)
      C
0200        JFLAG = IZERO
0201        CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0202        KDAY = ICHOOZ(JDAY)
0203        JTIME = JHOUR * 100 + JMIN
0204        KTIME = ICHOOZ(JTIME)
      C
0205        IF (ARRNBR .EQ. FOUR) GO TO 605
0207        IF (TRHOVG .LT. RHOMIN) GO TO 605
0209        IF (TRODIF .LT. 0.) GO TO 605
0211        IF (TVELOX .LT. 250.) GO TO 605
0213        IF (TVELOX .GT. 700.) GO TO 605
      C
0215        KSFLAG = INO
0216        IF (KSKIP .LE. 0) GO TO 604
0218        DO 606 I=1,KSKIP
0219        AZMINP = AZMIN(I)
0220        IF (AZMIN(I) .GT. AZMAX(I)) AZMINP = AZMIN(I) - 360.
0222        TAZIMY = TAZIMX
0223        IF ((AZMINP.LT.0.).AND.(TAZIMX.GT.AZMIN(I))) TAZIMY=TAZIMY-360.
0225        IF (IIBKNR .LT. IBKBEG(I)) GO TO 606
0227        IF (IIBKNR .GT. IBKFIN(I)) GO TO 606
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0229          IF (TVELOX .LT. VELMIN(I)) GO TO 606
0231          IF (TVELOX .GT. VELMAX(I)) GO TO 606
0233          IF (TAZIMY .LT. AZMINP) GO TO 606
0235          IF (TAZIMY .GT. AZMAX(I)) GO TO 606
0237          KSFLAG = IYES
0238      606 CONTINUE
0239          IF (KSFLAG .EQ. IYES) GO TO 605
      C
0241      604 ITSPQX = IROUND(FTSPQX)
0242          KTSPQX = ICHOOZ(ITSPQX)
0243          KIBKNR = ICHOOZ(IIBKNR)
0244          ITAZ = IROUND(TAZIMX)
0245          KTAZ = ICHOOZ(ITAZ)
0246          ITCZ = IROUND(TAZVAX)
0247          KTCZ = ICHOOZ(ITCZ)
0248          ITV = IROUND(TVELOX)
0249          ITCV = IROUND(TVEVAX)
0250          KTCV = ICHOOZ(ITCV)
0251          ILINE = ILINE + 1
0252          IILINE = IILINE + 1
0253          KLINE = ICHOOZ(ILINE)
      C
0254          IF (KLINE - 0) 610,611,612
0255      610 WRITE (18,401) ILINE,THREE
0256          GO TO 613
0257      611 WRITE (18,402) ILINE,THREE
0258          GO TO 613
0259      612 WRITE (18,403) ILINE,THREE
0260      613 IF (KTIME .GT. 1) GO TO 614
0262          IF (KTIME - 0) 6131,6132,6133
0263     6131 WRITE (18,404) JTIME
0264          GO TO 615
0265     6132 WRITE (18,4041) JTIME
0266          GO TO 615
0267     6133 WRITE (18,4042) JTIME
0268          GO TO 615
0269      614 WRITE (18,405) JTIME
0270      615 IF (KDAY - 0) 616,617,617
0271      616 WRITE (18,406) JDAY,AMONTH
0272          GO TO 618
0273      617 WRITE (18,407) JDAY,AMONTH
0274      618 IF (KIBKNR - 0) 619,620,621
0275      619 WRITE (18,408) IIBKNR
0276          GO TO 623
0277      620 WRITE (18,409) IIBKNR
0278          GO TO 623
0279      621 IF (KIBKNR .EQ. 2) GO TO 622
0281          WRITE (18,410) IIBKNR
0282          GO TO 623
0283      622 WRITE (18,411) IIBKNR
0284      623 IF (KTSPQX - 0) 624,625,626
0285      624 WRITE (18,412) ITSPQX,TRHOVX,TRODIF
0286          GO TO 627
0287      625 WRITE (18,413) ITSPQX,TRHOVX,TRODIF
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0288          GO TO 627
0289    626   WRITE (18,414) ITSPQX,TRHOVX,TRODIF
0290    627   IF (KTAZ - 0) 628,629,630
0291    628   WRITE (18,415) ITAZ
0292          GO TO 631
0293    629   WRITE (18,416) ITAZ
0294          GO TO 631
0295    630   WRITE (18,417) ITAZ
0296    631   IF (KTCZ - 0) 632,633,634
0297    632   WRITE (18,418) ITCZ,ITV
0298          GO TO 635
0299    633   WRITE (18,419) ITCZ,ITV
0300          GO TO 635
0301    634   WRITE (18,420) ITCZ,ITV
0302    635   IF (KTCV - 0) 636,637,638
0303    636   WRITE (18,421) ITCV
0304          GO TO 608
0305    637   WRITE (18,422) ITCV
0306          GO TO 608
0307    638   IF (KTCV .EQ. 2) GO TO 639
0309          WRITE (18,423) ITCV
0310          GO TO 608
0311    639   WRITE (18,424) ITCV
      C
0312    608   IF (ILINE .LT. LINCNT) GO TO 605
0314          INFNRM = INFNR
0315          ILINE = ILINE + 1
0316          NRSER = NRSER + 1
0317          INFNR = INFNR + 1
0318          MTIME = MTIME + 10
0319          IILINE = IILINE + 15
0320          LINCNT = LINCNT + 80
0321          WRITE (18,1185) NRSER
0322          WRITE (18,1180)
0323          IF (MTIME .LT. 1000) GO TO 6104
0325          IF (JULIAN .GE. 100) WRITE (18,1181) NRSER,JULIAN,MTIME
0327          IF (JULIAN .GE. 100) GO TO 6103
0329          IF (JULIAN .GE. 10) WRITE (18,1281) NRSER,JULIAN,MTIME
0331          IF (JULIAN .GE. 10) GO TO 6103
0333          WRITE (18,1381) NRSER,JULIAN,MTIME
0334    6103  IF (MDATE .GE. 10)
             &     WRITE (18,1189) MDATE,MTIME,BMONTH,JYEAR
0336          IF (MDATE .LT. 10)
             &     WRITE (18,1289) MDATE,MTIME,BMONTH,JYEAR
0338          GO TO 6106
0339    6104  IF (JULIAN .GE. 100) WRITE (18,1481) NRSER,JULIAN,MTIME
0341          IF (JULIAN .GE. 100) GO TO 6105
0343          IF (JULIAN .GE. 10) WRITE (18,1581) NRSER,JULIAN,MTIME
0345          IF (JULIAN .GE. 10) GO TO 6105
0347          WRITE (18,1681) NRSER,JULIAN,MTIME
0348    6105  IF (MDATE .GE. 10)
             &     WRITE (18,1389) MDATE,MTIME,BMONTH,JYEAR
0350          IF (MDATE .LT. 10)
             &     WRITE (18,1489) MDATE,MTIME,BMONTH,JYEAR
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0352   6106 WRITE (18,1182)
0353        WRITE (18,1183) JYEAR,INFNR
0354        WRITE (18,1184) JYEAR,INFNR
0355        IF (LINCNT .GT. 200) GO TO 6081
0357        WRITE (18,187) ILINE,JYEAR,INFNRM
0358        GO TO 605
0359   6081 WRITE (18,186) ILINE,JYEAR,INFNRM
0360   605  IF (ARRNBR .EQ. THREE) GO TO 209
      C.....................................................................
      C
      C     F array signal detection area
      C
0362   603  IDUM = IHEADR(2) - 3
0363        IF (IDUM .LE. IHBKNR) GO TO 209
0365        IF (FRHOVG .LT. RHOMIN) GO TO 209
0367        IF (FRODIF .LT. 0.) GO TO 209
0369        IF (FVELOX .LT. 250.) GO TO 209
0371        IF (FVELOX .GT. 700.) GO TO 209
      C
0373        KSFLAG = INO
0374        IF (KSKIP .LE. 0) GO TO 607
0376        DO 609 I = 1,KSKIP
0377        AZMINP = AZMIN(I)
0378        IF (AZMIN(I) .GT. AZMAX(I)) AZMINP = AZMIN(I) - 360.
0380        FAZIMY = FAZIMX
0381        IF ((AZMINP.LT.0.).AND.(FAZIMX.GT.AZMIN(I))) FAZIMY=FAZIMY-360.
0383        IF (IIBKNR .LT. IBKBEG(I)) GO TO 609
0385        IF (IIBKNR .GT. IBKFIN(I)) GO TO 609
0387        IF (FVELOX .LT. VELMIN(I)) GO TO 609
0389        IF (FVELOX .GT. VELMAX(I)) GO TO 609
0391        IF (FAZIMY .LT. AZMINP) GO TO 609
0393        IF (FAZIMY .GT. AZMAX(I)) GO TO 609
0395        KSFLAG = IYES
0396    609 CONTINUE
0397        IF (KSFLAG .EQ. IYES) GO TO 209
0399   607  IFSPQX = IROUND(FFSPQX)
0400        KFSPQX = ICHOOZ(IFSPQX)
0401        KDUM = ICHOOZ(IDUM)
0402        IFAZ = IROUND(FAZIMX)
0403        KFAZ = ICHOOZ(IFAZ)
0404        IFCZ = IROUND(FAZVAX)
0405        KFCZ = ICHOOZ(IFCZ)
0406        IFV = IROUND(FVELOX)
0407        IFCV = IROUND(FVEVAX)
0408        KFCV = ICHOOZ(IFCV)
0409        ILINE = ILINE + 1
0410        IILINE = IILINE + 1
0411        KLINE = ICHOOZ(ILINE)
      C
0412        IF (KLINE - 0) 640,641,642
0413   640  WRITE (18,401) ILINE,FOUR
0414        GO TO 643
0415   641  WRITE (18,402) ILINE,FOUR
0416        GO TO 643
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0417   642  WRITE (18,403) ILINE,FOUR
0418   643  IF (KTIME .GT. 1) GO TO 644
0420        IF (KTIME - 0) 6431,6432,6433
0421   6431 WRITE (18,404) JTIME
0422        GO TO 645
0423   6432 WRITE (18,4041) JTIME
0424        GO TO 645
0425   6433 WRITE (18,4042) JTIME
0426        GO TO 645
0427   644  WRITE (18,405) JTIME
0428   645  IF (KDAY - 0) 646,647,647
0429   646  WRITE (18,406) JDAY,AMONTH
0430        GO TO 648
0431   647  WRITE (18,407) JDAY,AMONTH
0432   648  IF (KDUM - 0) 649,650,651
0433   649  WRITE (18,408) IDUM
0434        GO TO 653
0435   650  WRITE (18,409) IDUM
0436        GO TO 653
0437   651  IF (KDUM .EQ. 2) GO TO 652
0439        WRITE (18,410) IDUM
0440        GO TO 653
0441   652  WRITE (18,411) IDUM
0442   653  IF (KFSPQX - 0) 654,655,656
0443   654  WRITE (18,412) IFSPQX,FRHOVX,FRODIF
0444        GO TO 657
0445   655  WRITE (18,413) IFSPQX,FRHOVX,FRODIF
0446        GO TO 657
0447   656  WRITE (18,414) IFSPQX,FRHOVX,FRODIF
0448   657  IF (KFAZ - 0) 658,659,660
0449   658  WRITE (18,415) IFAZ
0450        GO TO 661
0451   659  WRITE (18,416) IFAZ
0452        GO TO 661
0453   660  WRITE (18,417) IFAZ
0454   661  IF (KFCZ - 0) 662,663,664
0455   662  WRITE (18,418) IFCZ,IFV
0456        GO TO 665
0457   663  WRITE (18,419) IFCZ,IFV
0458        GO TO 665
0459   664  WRITE (18,420) IFCZ,IFV
0460   665  IF (KFCV - 0) 666,667,668
0461   666  WRITE (18,421) IFCV
0462        GO TO 670
0463   667  WRITE (18,422) IFCV
0464        GO TO 670
0465   668  IF (KFCV .EQ. 2) GO TO 669
0467        WRITE (18,423) IFCV
0468        GO TO 670
0469   669  WRITE (18,424) IFCV
0470   670  IF (ILINE .LT. LINCNT) GO TO 209
0472        INFNRM = INFNR
0473        ILINE = ILINE + 1
0474        NRSER = NRSER + 1
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0475          INFNR = INFNR + 1
0476          MTIME = MTIME + 10
0477          IILINE = IILINE + 15
0478          LINCNT = LINCNT + 80
0479          WRITE (18,1185) NRSER
0480          WRITE (18,1180)
0481          IF (MTIME .LT. 1000) GO TO 6114
0483          IF (JULIAN .GE. 100) WRITE (18,1181) NRSER,JULIAN,MTIME
0485          IF (JULIAN .GE. 100) GO TO 6113
0487          IF (JULIAN .GE. 10) WRITE (18,1281) NRSER,JULIAN,MTIME
0489          IF (JULIAN .GE. 10) GO TO 6113
0491          WRITE (18,1381) NRSER,JULIAN,MTIME
0492    6113  IF (MDATE .GE. 10)
             &     WRITE (18,1189) MDATE,MTIME,BMONTH,JYEAR
0494          IF (MDATE .LT. 10)
             &     WRITE (18,1289) MDATE,MTIME,BMONTH,JYEAR
0496          GO TO 6116
0497    6114  IF (JULIAN .GE. 100) WRITE (18,1481) NRSER,JULIAN,MTIME
0499          IF (JULIAN .GE. 100) GO TO 6115
0501          IF (JULIAN .GE. 10) WRITE (18,1581) NRSER,JULIAN,MTIME
0503          IF (JULIAN .GE. 10) GO TO 6115
0505          WRITE (18,1681) NRSER,JULIAN,MTIME
0506    6115  IF (MDATE .GE. 10)
             &     WRITE (18,1389) MDATE,MTIME,BMONTH,JYEAR
0508          IF (MDATE .LT. 10)
             &     WRITE (18,1489) MDATE,MTIME,BMONTH,JYEAR
0510    6116  WRITE (18,1182)
0511          WRITE (18,1183) JYEAR,INFNR
0512          WRITE (18,1184) JYEAR,INFNR
0513          IF (LINCNT .GT. 200) GO TO 601
0515          WRITE (18,187) ILINE,JYEAR,INFNRM
0516          GO TO 209
0517    601   WRITE (18,186) ILINE,JYEAR,INFNRM
0518          GO TO 209
      C.....................................................................
      C
      C     Output restructuring area
      C
0519    700   REWIND 18
0520          KCOUNT = 0
0521    710   JCOUNT = 0
0522    720   READ (18,425,END=750) (ICHAR(J), J = 1,79)
0523    730   IF (ICHAR(1) .NE. ICHRBK) GO TO 740
0525          WRITE (19,188) ICHRLF,ICHRLF,ICHRLF,ICHRLF,ICHRLF,ICHRLF,ICHRLF
0526    740   JCOUNT = JCOUNT + 1
0527          IF (ICHAR(JCOUNT) .EQ. 0) GO TO 710
0529          IF (ICHAR(JCOUNT) .NE. ICHRCR) GO TO 740
0531          ICHAR (JCOUNT) = ICR
0532          WRITE (19,425) (ICHAR(I),I = 1,JCOUNT)
0533          KCOUNT = KCOUNT + 1
0534          IF (KCOUNT .GE. IILINE) GO TO 750
0536          GO TO 710
0537    750   WRITE (19,185) ICR,ICR,NRSER,ICR
0538          WRITE (19,188) ICHRLF,ICHRLF,ICHRLF,ICHRLF,ICHRLF,ICHRLF,ICHRLF
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0539          CLOSE (UNIT=18,DISP='DELETE')
0540          CALL EXIT
      C.....................................................................
      C
      C       FORMATs area
      C
0541     10   FORMAT (/,' RPTSCN Rev 8.')
0542     12   FORMAT (A1)
0543     13   FORMAT (' F,T or B? ',$)
0544     14   FORMAT (F6.2)
0545     15   FORMAT (' Rewind tape ?  <otherwise EXIT!> ',$)
0546     151  FORMAT (' Continue in this file on tape? ',$)
0547     16   FORMAT (' SKIP PARAMS:START,STOP,AZMIN,AZMAX,',
            &             'VMIN,VMAX?',$)
0548     161  FORMAT (2I6,4F10.3)
0549     171  FORMAT (' Number of channels? ',$)
0550     172  FORMAT (' Julian day? ',$)
0551     173  FORMAT (' Month? ',$)
0552     174  FORMAT (' Date of month? ',$)
0553     175  FORMAT (' Time of message? ',$)
0554     176  FORMAT (' Serial nr? ',$)
0555     177  FORMAT (' Infrasonics nr? ',$)
0556     18   FORMAT (' Minimum RHO? ',$)
0557     180  FORMAT ('%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%',A1)
0558    2181  FORMAT ('HRATUZYUW RUHHWEB',3I4,'-UUUU--RUEBALB.[',A1)
0559    2281  FORMAT ('HRATUZYUW RUHHWEB',I4,' 0',I2,I4,
            &          '-UUUU--RUEBALB.[',A1)
0560    2381  FORMAT ('HRATUZYUW RUHHWEB',I4,' 00',I1,I4,
            &          '-UUUU--RUEBALB.[',A1)
0561    2481  FORMAT ('HRATUZYUW RUHHWEB',2I4,'0',I3,'-UUUU--RUEBALB.[',A1)
0562    2581  FORMAT ('HRATUZYUW RUHHWEB',I4,' 0',I2,'0',I3,
            &          '-UUUU--RUEBALB.[',A1)
0563    2681  FORMAT ('HRATUZYUW RUHHWEB',I4,' 00',I1,'0',I3,
            &          '-UUUU--RUEBALB.[',A1)
0564    2189  FORMAT ('ZNR UUUUU',A1,/,'R',I3,I4,'Z ',A3,I3,A1)
0565    2289  FORMAT ('ZNR UUUUU',A1,/,'R 0',I1,I4,'Z ',A3,I3,A1)
0566    2389  FORMAT ('ZNR UUUUU',A1,/,'R',I3,'0',I2,'Z ',A3,I3,A1)
0567    2489  FORMAT ('ZNR UUUUU',A1,/,'R 0',I1,'0',I2,'Z ',A3,I3,A1)
0568     182  FORMAT ('FM MCMURDO STATION ANTARCTICA',A1,/,'TO GEOPHYSICAL ',
            &             'INSTITUTE FAIRBANKS AK//TELEX NR 35414//',A1)
0569     183  FORMAT ('ACCT NS-WCAB',A1,/,'BT',A1,/,' UNCLAS INFRASONICS NR',
            &             I3,'-',I4,A1,/,'PASS TO DR C WILSON',A1)
0570     184  FORMAT ('SUBJ: INFRASONICS REPORT',I3,'-',I4,A1)
0571     185  FORMAT ('CHEERS, BRUCE',A1,/,'BT',A1,/,'#',I4,'[',A1)
0572    1180  FORMAT ('%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%_')
0573    1181  FORMAT ('HRATUZYUW RUHHWEB',3I4,'-UUUU--RUEBALB.[_')
0574    1281  FORMAT ('HRATUZYUW RUHHWEB',I4,' 0',I2,I4,
            &          '-UUUU--RUEBALB.[_')
0575    1381  FORMAT ('HRATUZYUW RUHHWEB',I4,' 00',I1,I4,
            &          '-UUUU--RUEBALB.[_')
0576    1481  FORMAT ('HRATUZYUW RUHHWEB',2I4,'0',I3,'-UUUU--RUEBALB.[_')
0577    1581  FORMAT ('HRATUZYUW RUHHWEB',I4,' 0',I2,'0',I3,
            &          '-UUUU--RUEBALB.[_')
0578    1681  FORMAT ('HRATUZYUW RUHHWEB',I4,' 00',I1,'0',I3,
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```
     &        '-UUUU--RUEBALB.[_')
0579  1189 FORMAT ('ZNR UUUUU_',/,'R',I3,I4,'Z ',A3,I3,'_')
0580  1289 FORMAT ('ZNR UUUUU_',/,'R 0',I1,I4,'Z ',A3,I3,'_')
0581  1389 FORMAT ('ZNR UUUUU_',/,'R',I3,'0',I3,'Z ',A3,I3,'_')
0582  1489 FORMAT ('ZNR UUUUU_',/,'R 0',I1,'0',I3,'Z ',A3,I3,'_')
0583  1192 FORMAT ('FM MCMURDO STATION ANTARCTICA_',/,'TO GEOPHYSICAL
     &        'INSTITUTE FAIRBANKS AK//TELEX NR 25414//_')
0584  1193 FORMAT ('ACCT NS-WCAB_',/,'BT_',/,'UNCLAS INFRASONICS NR',
     &        I3,'-',I4,'_',/,'PASS TO DR C WILSON_')
0585  1194 FORMAT ('SUBJ: INFRASONICS REPORT',I3,'-',I4,'_')
0586  1185 FORMAT ('CHEERS, BRUCE_',/,'BT_',/,'#',I4,'[_')
0587   186 FORMAT (I3,'.CONTINUED FROM MSG NR',I3,'-',I4,'_')
0588   187 FORMAT (I2,'.CONTINUED FROM MSG NR',I3,'-',I4,'_')
0589   188 FORMAT (7A1,'NNNN[[[[[[[[[[[[[[[[[[[[[[[[[[[[',
     &        '%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%')
0590    19  FORMAT (2I6)
0591   190 FORMAT (' Start,Stop: ',$)
0592   191 FORMAT (A3)
0593   193 FORMAT (' Year? ',$)
0594   196 FORMAT (7I3)
0595   401 FORMAT (I1,'.',A1,':',$)
0596   402 FORMAT (I2,'.',A1,':',$)
0597   403 FORMAT (I3,'.',A1,':',$)
0598   404 FORMAT ('000',I1,'UT ',$)
0599  4041 FORMAT ('00',I2,'UT ',$)
0600  4042 FORMAT ('0',I3,'UT ',$)
0601   405 FORMAT (I4,'UT ',$)
0602   406 FORMAT (I1,A3,1X,$)
0603   407 FORMAT (I2,A3,1X,$)
0604   408 FORMAT ('BK',I1,1X,$)
0605   409 FORMAT ('BK',I2,1X,$)
0606   410 FORMAT ('BK',I3,1X,$)
0607   411 FORMAT ('BK',I4,1X,$)
0608   412 FORMAT ('SE',I1,' R',F4.2,' DR',F4.2,1X,$)
0609   413 FORMAT ('SE',I2,' R',F4.2,' DR',F4.2,1X,$)
0610   414 FORMAT ('SE',I3,' R',F4.2,' DR',F4.2,1X,$)
0611   415 FORMAT ('AZ',I1,1X,$)
0612   416 FORMAT ('AZ',I2,1X,$)
0613   417 FORMAT ('AZ',I3,1X,$)
0614   418 FORMAT ('CZ',I1,' V',I3,1X,$)
0615   419 FORMAT ('CZ',I2,' V',I3,1X,$)
0616   420 FORMAT ('CZ',I3,' V',I3,1X,$)
0617   421 FORMAT ('CV',I1,'_')
0618   422 FORMAT ('CV',I2,'_')
0619   423 FORMAT ('CV',I3,'_')
0620   424 FORMAT ('CV',I4,'_')
0621   425 FORMAT (80A1)
0622       END
```

```
      C************ RTG8CH.FOR ***********************************************
      C
      C     Date of this revision: 19-May-84
      C
0001        PROGRAM RTG8CH
      C
      C     COMMON/array/DATA area
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        COMMON /IARRAY/ IA2DBK(2730),IBKRDY,ICHNL(8)
0004        COMMON /PASBLK/ IWKHDR(20),IFCHNL(512,4),ITCHNL(512,4)
0005        COMMON /APARAM/ FXDIF(6),FYDIF(6),FTDIF(6),FSIGMA(4),TXDIF(6),
           (TYDIF(6),TTDIF(6),TSIGMA(4)
0006        COMMON /ANALYS/ FFSPQX,FRHOVG,FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FTSPQX,TRHOVG,TVELOC,
           (TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),TPSI(4),TRHO(6),ITMAX(4),
           (ITMIN(4)
0007        DIMENSION JTAIL(98),ITAIL(150)
0008        EQUIVALENCE (FFSPQX,JTAIL(1)),(ITAIL(1),IA2DBK(2581))
0009        COMMON /MISC/ ITMPRY(1536),IFCNBR,ITCNBR,ISTAT,ITRGRY(129),
           (CALLER,INRDIF,INRCHL,ITRMAX,ITWEAK,FIMGRY(256,4),
           (IXFLGF(6),IXFLGT(6),FDIFA(6),TDIFA(6)
      C
0010        DATA ICHNL/0,1,2,3,4,5,6,7/,ITWEAK/1/,ARRNBR/1HB/
0011        DATA INBUFF/"177562/,IMASK/"177/,IADCSR/"177000/,IADBUF/"177002/
0012        DATA IGETDT/-1/,IINTDT/0/,FOUR/1HF/,THREE/1HT/,BOTH/1HB/
0013        DATA XNO/1HN/,YES/1HY/,INO/-1/,IYES/1/,PIOVRN/.0122719/
0014        DATA ICSTRT/1HC/,IRSTRT/1HR/,ITWEAK/1/
0015        DATA IUNIT/00/,IDNSTY/900/,IPARTY/1/
      C.....................................................................
      C
      C     Program and mag tape initialization area.
      C
      C
0016   999  CALL REWTAP(IUNIT,ISTATU)
      C
0017   998  PAUSE ' MOUNT tape!!'
0018        TYPE 10
      C
0019   102  CALL MTINIT(IUNIT)
0020        IF (ISTATU(1) .NE. IYES) STOP
0022        CALLER = BOTH
0023        CALL CHLMIX(8)
      C
0024        DO 110,I = 1,1536
0025   110  ITMPRY(I) = 0
0026        DO 111,I = 1,98
0027   111  JTAIL(I) = 0
0028        DO 105,I = 1,8
0029   105  ICHNL(I) = I - 1
0030        DO 106,I = 1,6
0031        FTDIF(I) = 0.
0032   106  TTDIF(I) = 0.
      C
```

```
0033          RINDX = 0.
0034          DO 119,I = 1,129
0035          THETAN = COS(PIOVRN*RINDX)
0036          ITRGRY(I) = IFIX(32767.*THETAN + .5)
0037    119   RINDX = RINDX + 1.
      C
0038    109   TYPE 193
0039          ACCEPT 14,JYEAR
0040    112   JFLAG = IGETDT
0041          CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0042    108   TYPE 194,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0043          ACCEPT 12,ANSWER
0044          IF (ANSWER .NE. XNO) GO TO 107
0046          TYPE 195
0047          ACCEPT 196,JYEAR,JFLAG,JDAY,JHOUR,JMIN
0048          CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0049          GO TO 112
      C
0050    107   TYPE 19
0051          ACCEPT 12,ANSWER
0052          IF (ANSWER .NE. YES) GO TO 300
      C
0054          TYPE 13
0055          ACCEPT 12,ARRNBR
0056          IF (ARRNBR .EQ. THREE) GO TO 103
      C
0058          TYPE 15,FOUR
0059          ACCEPT 14,IFCNBR
0060          IF (IFCNBR .EQ. 4) GO TO 104
0062    114   TYPE 18
0063          ACCEPT 14,IFCHLM
0064          CALLER = FOUR
0065          CALL CHLMIX(IFCHLM)
0066    104   IF (ARRNBR .EQ. FOUR) GO TO 101
      C
0068    103   TYPE 15,THREE
0069          ACCEPT 14,ITCNBR
0070          IF (ITCNBR .EQ. 4) GO TO 101
0072    113   TYPE 181
0073          ACCEPT 14,ITCHLM
0074          CALLER = THREE
0075          CALL CHLMIX(ITCHLM)
      C
0076    101   TYPE 16
0077          ACCEPT 196, ICHNL
0078          TYPE 196,ICHNL
0079          GO TO 107
      C.....................................................................
      C
      C       Main program
      C
0080    300   IBKRDY = INO
0081          IA2DBK(2) = 0
0082          IA2DBK(16) = 0
```

```
0083   301  CALL A2DRTG(IA2DBK,IBKRDY,ISTATU,ICHNL)
0084        JFLAG = IGETDT
0085        CALL RTCLOK(JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0086        IF (IHUNG .NE. IYES) GO TO 303
0088        TYPE 11
0089        IA2DBK(16) = IYES
0090        IHUNG = INO
      C
0091   303  IPROBE = IPEEK(INBUFF)
0092        IPROBE = (IPROBE .AND. IMASK)
0093        IPROBE = IPROBE + 8192
0094        IF (IPROBE .EQ. ICSTRT) GO TO 302
0096        IF (IPROBE .EQ. IRSTRT) GO TO 306
0098        JFLAG = IGETDT
0099        CALL RTCLOK(JFLAG,ISTATU(11),ISTATU(10),ISTATU(9),ISTATU(8),
           &ISTATU(7))
0100        IF (ISTATU(8) .LT. JMIN) ISTATU(8) = ISTATU(8) + 60
0102        ISTATU(8) = ISTATU(8) - 5
0103        IF (ISTATU(8) .GT. JMIN) IHUNG = IYES
0105        IF (IHUNG .EQ. IYES) GO TO 301
0107        IF (IBKRDY .NE. IYES) GO TO 303
      C
      C     A data block is filled!
      C
0109        CALL UNWIND (IA2DBK,IWKHDR,ITMPRY)
0110        CALL INIA2D
0111        GO TO 600
      C
0112   306  CALL IPOKE(IADCSR,0)
0113        DO 307,I = 1,2
0114        CALL EOFTAP(IUNIT,ISTATU)
0115        IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0117   307  CONTINUE
0118        GO TO 999
      C
0119   302  CALL IPOKE(IADCSR,0)
0120        CALL EOFTAP(IUNIT,ISTATU)
0121        IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0123        GO TO 102
      C.....
      C
      C     Analysis area
      C
      C
0124   600  IIBKNR = IWKHDR(2)
0125        JMONDA = IWKHDR(3)
0126        JHRMIN = IWKHDR(4)
0127        JSEC = IWKHDR(5)
0128        IERRTO = IWKHDR(17)
0129        ISKWER = IWKHDR(18)
0130        IOVRNG = IWKHDR(19)
0131        IUNDRN = IWKHDR(20)
0132        IA2DBK(16) = 0
      C
```

```
0133          JFLAG = IINTDT
0134          JDAY = JMONDA
0135          JHOUR = JHRMIN
0136          CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0137          TYPE 197,IIBKNR,IERRTO,ISKWER,IOVRNG,IUNDRN
0138          TYPE 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
      C
0139          IF (ARRNBR .EQ. FOUR) GO TO 603
0141          FTSPQX = 0.
0142          CALLER = THREE
0143          CALL RTGTDA
0144          DO 608,I = 54,98
0145    608   ITAIL(4+I) = JTAIL(I)
      C
0146          IF (ITSTAT .LT. 0) GO TO 605
0148          CALL FILTER
0149          IF (FTSPQX .GT. 0.) GO TO 606
0151          TYPE 192,CALLER
0152          GO TO 605
      C
0153    606   CALL RTGTDA
0154          DO 607,I = 50,61
0155    607   ITAIL(53+I) = JTAIL(I)
      C
      C
0156    605   IF (ARRNBR .EQ. THREE) GO TO 609
      C.....................................................................
      C
0158    603   TYPE 191
0159          FFSPQX = 0.
0160          CALLER = FOUR
0161          CALL RTGTDA
0162          DO 604,I = 1,45
0163    604   ITAIL(I) = JTAIL(4+I)
      C
0164          IF (IFSTAT .LT. 0) GO TO 609
0166          CALL FILTER
0167          IF (FFSPQX .GT. 0.) GO TO 602
0169          TYPE 192,CALLER
0170          GO TO 609
      C
0171    602   CALL RTGTDA
0172          DO 601,I = 1,12
0173    601   ITAIL(45+I) = JTAIL(I)
      C
0174    609   IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0176          IBKRDY = INO
0177          GO TO 303
      C.....................................................................
      C
      C     FORMATs area
      C
0178     10   FORMAT (/,' RTG8CH Rev 22.5',$)
0179     11   FORMAT (6X,'***HUNG!***',$)
```

```
0180     12  FORMAT (A1)
0181     13  FORMAT (' F,T or B? '$)
0182     14  FORMAT (3I2)
0183     15  FORMAT (' ',A1,' array: 3 or 4? ',$)
0184     16  FORMAT (' A2D channels (missing channel in 4th position): ',$)
0185     18  FORMAT (' Missing channel <0,1,2,3 (or 8 if none)>: ',$)
0186     181 FORMAT (' Missing channel <4,5,6,7 (or 8 if none)>: ',$)
0187     19  FORMAT (' Changes?',$)
0188     191 FORMAT (' ',$)
0189     192 FORMAT (' ',A1,3X,'***INVALID FILTER!!***',$)
0190     193 FORMAT (' Year? ',$)
0191     194 FORMAT (' Time:',I3,'-',A3,'-',I2,I4,':',I2,' ',I2,'"UT?? ',$)
0192     195 FORMAT (' Correct time? (Y,M,D,H,M) ',$)
0193     196 FORMAT (8I3)
0194     197 FORMAT (/,' #',5I6,$)
0195     198 FORMAT (' @W8A',I3,'-',A3,'-',I2,I4,':',I2,' ',I2,'"UT.',$)
0196     199 FORMAT (' ',A1,6F7.1,' Correct? :',$)
       C.....................................................................
       C
0197    500  STOP
0198         END
```

```
      C************  SCAN.FOR  ********************************************
      C
      C     Date of revision: 12-Oct-84
      C
0001        PROGRAM SCAN
      C
      C     PURPOSE
      C        To scan a tape for blocks of interest
      C
      C     USAGE
      C        RUN SCAN
      C
      C     INPUT PARAMETERS
      C        YEAR   - A two digit integer
      C        F,T,B  - Selects F array, T array, or Both arrays
      C        RHOMIN - Minimum average PREfiltered correlation coefficient for
      C                 blocks of interest (default 0.5 if T, 0.4 if F)
      C        STATS  - If Y is entered, statistics will be printed for each
      C                 block of interest
      C        NRCHNL - Number of channels in array (default 4)
      C        START  - Integer value of first block to be scanned
      C        STOP   - Integer value of last block to be scanned
      C        BEYOND - If Y is entered, another scan is permitted
      C        REWIND - If Y is entered, tape is rewound and another scan is
      C                 permitted
      C
      C     REMARKS
      C        None
      C
      C     LIBRARIES REQUIRED
      C        REDLIB,MACLIB
      C
      C     METHOD
      C        The program scans the trailer data of the tape starting at START.
      C        If the value of RHO is greater than RHOMIN then the analysis data
      C        (and statistics if requested) are printed.  When an EOF (end-of-
      C        file) or the STOP block is encountered, the program then allows
      C        for another scan.
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        DIMENSION IWKSPC(2730),IMPONG(2730)
0004        COMMON /TRAILY/ IMPING(2580),FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FFSPQX,FRHOVX,FVELOX,
           (FAZIMX,FVEVAX,FAZVAX,TVELOC,TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),
           (TPSI(4),TRHO(6),ITMAX(4),ITMIN(4),FTSPQX,TRHOVX,TVELOX,TAZIMX,
           (TVEVAX,TAZVAX
0005        DIMENSION IHEADR(20),IHEAD1(20)
0006        DIMENSION FSIGMA(4),TSIGMA(4)
0007        EQUIVALENCE (IMPING(1),IMPONG(1))
      C
0008        DATA IZERO/0/,FOUR/1HF/,THREE/1HT/,BOTH/1HB/
0009        DATA XNO/1HN/,YES/1HY/,INO/-1/,IYES/1/,ZERO/0./
0010        DATA IUNIT/00/,IDNSTY/900/,IPARTY/1/,IREV/-1/
      C.....................................................................
```

```
      C
      C     Program and mag tape initialization area.
      C
0011   100  TYPE 10
0012        TYPE 193
0013        ACCEPT 19,JYEAR
      C
0014   102  CALL MTINIT(IUNIT)
0015        IF (ISTATU(1) .NE. IYES) STOP
      C
0017   110  IGFLAG = INO
0018        TYPE 13
0019        ACCEPT 12,ARRNBR
      C
0020        TYPE 18
0021        ACCEPT 14,RHOMIN
0022        IF (RHOMIN .NE. 0.) GO TO 111
0024        IF (ARRNBR .EQ. THREE) RHOMIN = 0.6
0026        IF (ARRNBR .EQ. FOUR) RHOMIN = 0.5
0028        IF ((ARRNBR .NE. THREE) .AND. (ARRNBR .NE. FOUR)) GO TO 110
0030   111  TYPE 16
0031        ACCEPT 12,STATS
0032        INRDIF = 6
0033        TYPE 171
0034        ACCEPT 19,NRCHNL
0035        IF (NRCHNL .EQ. 3) INRDIF = 3
0037        FNRDIF = FLOAT(INRDIF)
      C.....................................................................
      C
      C     Tape read area
      C
0038   200  TYPE 190
0039        ACCEPT 19,ISTART,ISTOP
0040        IF (ISTART .EQ. 0) ISTART = 1
0042        IF (ISTOP .EQ. 0) ISTOP = 10000
0044        ISTOP = ISTOP + 1
      C
0045        DO 243,I = 2581,2730
0046   243  IMPING(I)=0
      C
0047   209  IF (IGFLAG .EQ. IYES) GO TO 201
0049        CALL REDTAP(IUNIT,IMPING,INRBYT,ISTATU)
0050        IF (ISTATU(1) .EQ. IYES) GO TO 205
0052        CALL MTSTAT(IUNIT)
0053        IF (ISTATU(8) .EQ. IYES) GO TO 208
0055        GO TO 209
      C
0056   205  IF (IMPING(2) .EQ. ISTART) GO TO 220
0058        IFWD = ISTART - IMPING(2)
0059        IFWD = IFWD - 1
0060        IF (IFWD .EQ. 0) GO TO 209
0062        CALL SPCTAP (IUNIT,IFWD,ISTATU)
0063        IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0065        GO TO 209
```

```
      C
0066   220  IF (IMPING(2) .LE. ISTOP) GO TO 204
      C
0068   208  PAUSE ' ***DONE***'
0069        IHEADR(2) = 0
0070        IHEAD1(2) = 0
0071        IHBKNR = 0
      C
0072        TYPE 151
0073        ACCEPT 12, BEYOND
0074        IF (BEYOND .EQ. YES) PRINT 153
0076        IF (BEYOND .EQ. YES) GO TO 110
0078        TYPE 15
0079        ACCEPT 12, REWIND
0080        IF (REWIND. NE. YES) CALL EXIT
0082        PRINT 153
0083        CALL REWTAP (IUNIT,ISTATU)
0084        IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0086        GO TO 110
      C
0087   204  CALL REDTAP(IUNIT,IWKSPC,INRBYT,ISTATU)
0088        IF (ISTATU(1) .EQ. IYES) GO TO 211
0090        CALL MTSTAT(IUNIT)
0091        IF (ISTATU(8) .EQ. IYES) GO TO 208
0093        GO TO 204
      C
0094   211  IF (IWKSPC(2) .NE. IMPING(2)) GO TO 214
0096        IF (IWKSPC(4) .NE. IMPING(4)) GO TO 214
0098        TYPE 17,IMPING(2)
      C
0099   201  DO 217,I = 1,2730
0100   217  IMPING(I) = IWKSPC(I)
0101        IGFLAG = INO
0102        GO TO 204
      C
0103   214  IGFLAG = IYES
0104        IF (IMPING(2) .GT. ISTOP) GO TO 208
      C.....................................................................
      C
      C     Tape block setup area
      C
0106   300  DO 301,I = 1,20
0107        IHEADR(I) = IHEAD1(I)
0108   301  IHEAD1(I) = IMPING(I)
0109        IF (IHEADR(16) .EQ. IYES) IHBKNR = IHEADR(2) - 1
0111        IF (IHEADR(16) .EQ. IYES) TYPE 154,IHBKNR
      C
0113        FRHOVG = 0.
0114        DO 302,I = 1,INRDIF
0115   302  FRHOVG = FRHOVG + FRHO(I)
0116        FRHOVG = FRHOVG/FNRDIF
      C
0117        DO 304,I = 1,4
0118        FSIGMA(I) = FPSI(I)**2 - FMU(I)**2
```

```
0119          IF (FSIGMA(I) .LT. 0.) FSIGMA(I) = 0.
0121    304   FSIGMA(I) = SQRT(FSIGMA(I))
      C
0122          TRHOVG = 0.
0123          DO 303,I = 1,4
0124          TSIGMA(I) = TPSI(I)**2 - TMU(I)**2
0125          IF (TSIGMA(I) .LT. 0.) TSIGMA(I) = 0.
0127    303   TSIGMA(I) = SQRT(TSIGMA(I))
      C
0128          DO 305,I = 1,INRDIF
0129    305   TRHOVG = TRHOVG + TRHO(I)
0130          TRHOVG = TRHOVG/FNRDIF
0131          TRODIF = TRHOVX - TRHOVG
0132          FRODIF = FRHOVX - FRHOVG
      C
0133          IF (IHEADR(2) .GE. ISTART) GO TO 600
0135          GO TO 209
      C.....................................................................
      C
      C       T array signal detection area
      C
0136    600   IF (TRHOVG .GE. RHOMIN) GO TO 623
0138          IF (FRHOVG .GE. RHOMIN) GO TO 623
0140          IF (TRODIF .LT. -0.1) GO TO 623
0142          IF (FRODIF .LT. -0.1) GO TO 623
0144          GO TO 209
      C
0145    623   IIBKNR = IHEADR(2)
0146          JDAY = IHEADR(3)
0147          JHOUR = IHEADR(4)
0148          JSEC = IHEADR(5)
0149          IERRTO = IHEADR(17)
0150          IZERON = IHEADR(18)
0151          IOVRNG = IHEADR(19)
0152          IUNDRN = IHEADR(20)
      C
0153          JFLAG = IZERO
0154          CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0155          IPFLAG = INO
0156          IEFLAG = INO
      C
0157          IF (ARRNBR .EQ. FOUR) GO TO 605
0159          IF (TRODIF .GT. -0.1) GO TO 609
0161          IF (STATS .EQ. YES) GO TO 661
0163          TTMIN = 0.
0164          TTMAX = 0.
0165          DO 641 I = 1,4
0166          TTMIN = TTMIN + FLOAT(ITMIN(I))
0167    641   TTMAX = TTMAX + FLOAT(ITMAX(I))
0168          TTMAX = ABS(TTMAX) + ABS(TTMIN)
0169          IF (TTMAX .LT. 1500.) GO TO 605
0171          PRINT 11,TRODIF,IIBKNR,THREE,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0172          GO TO 605
0173    609   IF (TRHOVG .LT. RHOMIN) GO TO 605
```

```
0175          IF (STATS .NE. YES) GO TO 610
0177          IF (ITSTAT - 0) 601,604,606
0178    601   PRINT 180,THREE
0179          GO TO 604
0180    606   IF (TVELOX .LT. 250.) GO TO 605
0182          IF (TVELOX .GT. 700.) GO TO 605
0184    661   PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0185          IPFLAG = IYES
0186          PRINT 183,IHEADR(2),ZERO,TAZVAR,TVEVAR,TAZIMF,TVELOC,TRHOVG,TRODIF
      C
0187    604   PRINT 197,IIBKNR,IERRTO,IZERON,IOVRNG,IUNDRN
0188          IEFLAG = IYES
0189          PRINT 191,THREE,TRHO
0190          DO 611,I = 1,4
0191          III=I+3
0192    611   PRINT 185,III,ITMAX(I),ITMIN(I),TMU(I),TPSI(I),TSIGMA(I)
      C
0193    610   IF ((STATS .NE. YES).AND.(TRODIF.LT.0.)) GO TO 605
0195          IF (FTSPQX - 0.) 612,613,614
0196    612   PRINT 192,THREE
0197          GO TO 605
      C
0198    613   PRINT 180,THREE
0199          GO TO 605
      C
0200    614   IF (TVELOX .LT. 250.) GO TO 605
0202          IF (TVELOX .GT. 700.) GO TO 605
0204          IF (IPFLAG .EQ. IYES) GO TO 630
0206          PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0207          IPFLAG = IYES
0208    630   PRINT 183,IHEADR(2),FTSPQX,TAZVAX,TVEVAX,TAZIMX,TVELOX,
             &     TRHOVX,TRODIF
      C
0209    605   IF (ARRNBR .EQ. THREE) GO TO 209
      C.....................................................................
      C
      C     F array signal detection area
      C
0211    603   IDUM = IHEADR(2) - 3
0212          IF (IDUM .LE. IHBKNR) GO TO 209
0214          IF (FRODIF .GT. -0.1) GO TO 621
0216          IF (STATS .EQ. YES) GO TO 662
0218          FFMIN = 0.
0219          FFMAX = 0.
0220          DO 642 I = 1,4
0221          FFMIN = FFMIN + FLOAT(IFMIN(I))
0222    642   FFMAX = FFMAX + FLOAT(IFMAX(I))
0223          FFMAX = ABS(FFMIN) + ABS(FFMAX)
0224          IF (FFMAX .LT. 1500.) GO TO 209
0226          PRINT 11,FRODIF,IDUM,FOUR,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0227          GO TO 209
0228    621   IF (FRHOVG .LT. RHOMIN) GO TO 209
0230          IF (STATS .NE. YES) GO TO 615
0232          IF (IFSTAT - 0) 607,602,608
```

```
0233    607  PRINT 180,FOUR
0234         GO TO 602
0235    608  IF (FVELOX .LT. 250.) GO TO 209
0237         IF (FVELOX .GT. 700.) GO TO 209
0239    662  IF (IPFLAG .EQ. IYES) GO TO 631
0241         PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0242         IPFLAG = IYES
0243    631  PRINT 182,IDUM,IHEADR(2),ZERO,FAZVAR,FVEVAR,FAZIMF,
            &     FVELOC,FRHOV6,FRODIF
      C
0244    602  IF (IEFLAG .EQ. IYES) GO TO 632
0246         PRINT 197,IIBKNR,IERRTO,IZERON,IOVRNG,IUNDRN
0247    632  PRINT 181,FOUR,FRHO
0248         DO 616,I = 1,4
0249         III=I-1
0250    616  PRINT 185,III,IFMAX(I),IFMIN(I),FMU(I),FPSI(I),FSIGMA(I)
      C
0251    615  IF ((STATS .NE. YES).AND.(FRODIF.LT.0.)) GO TO 209
0253         IF (FFSPQX - 0.) 617,618,619
0254    617  PRINT 192,FOUR
0255         GO TO 209
      C
0256    618  PRINT 180,FOUR
0257         GO TO 209
      C
0258    619  IF (FVELOX .LT. 250.) GO TO 209
0260         IF (FVELOX .GT. 700.) GO TO 209
0262         IF (IPFLAG .EQ. IYES) GO TO 633
0264         PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC
0265    633  PRINT 182,IDUM,IHEADR(2),FFSPQX,FAZVAX,FVEVAX,FAZIMX,
            &     FVELOX,FRHOVX,FRODIF
0266         GO TO 209
      C.....................................................................
      C
      C     FORMATs area
      C
0267     10  FORMAT (/,' SCAN Rev 8.2')
0268     11  FORMAT (' Change in RHO equals',F6.2,5X,'Block #',I5,1X,A1,
            &              ' array   @',I3,'-',A3,'-',I2,I4,':',I2,I3,'"UT.')
0269     12  FORMAT (A1)
0270     13  FORMAT (' F,T or B? ',$)
0271     14  FORMAT (F6.2)
0272     15  FORMAT (' Rewind tape ? (otherwise EXIT!) ',$)
0273    151  FORMAT (' Continue in this file on tape? ',$)
0274    153  FORMAT ('1')
0275    154  FORMAT (' HUNG at block #',I6)
0276     16  FORMAT (' Statistics? ',$)
0277     17  FORMAT (' BAD Block, #',I5)
0278    171  FORMAT (' Number of channels? ',$)
0279     18  FORMAT (' Minimum RHO? ',$)
0280    180  FORMAT (' ',A1,3X,'***INVALID ANALYSIS!!***')
0281    181  FORMAT (' ',A1,3X,6F5.2)
0282    182  FORMAT (' F',I4,' to',I5,F13.1,2F6.1,6X,2F7.1,4X,
            &     '(',F4.2,')',F5.2)
```

```
0283     183 FORMAT (' T',I4,15X,F5.1,2F6.1,9X,2F7.1,3X,'(',F4.2,')',F5.2)
0284     185 FORMAT (' ',I1,2I6,3F7.1)
0285      19  FORMAT (2I6)
0286     190 FORMAT (' Start,Stop: ',$)
0287     192 FORMAT (' ',A1,3X,'***INVALID FILTER!!***')
0288     193 FORMAT (' Year? ',$)
0289     197 FORMAT (' #',5I6)
0290     198 FORMAT (' @ WBA',I3,'-',A3,'-',I2,I4,':',I2,' ',I2,'"UT.')
         C.....................................................................
         C
0291      500  STOP
0292           END
```

```
      C************  STATS.FOR  ********************************************
      C
      C     Date of revision: 11-Oct-84
      C
0001        PROGRAM STATS
      C
      C     PURPOSE
      C        To scan one or more tapes and determine average values
      C        of statistics and output to the printer (UNIT 6).
      C
      C     USAGE
      C        RUN SCAN
      C
      C     INPUT PARAMETERS
      C        YEAR    - A two digit integer
      C        F,T,B   - Selects F array, T array, or Both arrays
      C        RHOMIN  - Minimum average correlation coefficient for blocks of
      C                  interest
      C        DIFMIN  - Minimum change in average correlation coefficient after
      C                  polarization filtering
      C        VELMIN  - Minimum value of velocity for blocks of interest
      C        VELMAX  - Maximum value of velocity for blocks of interest
      C        STATS   - If Y is entered, statistics will be printed for each
      C                  block of interest
      C        START   - Integer value of first block to be scanned
      C        STOP    - Integer value of last block to be scanned
      C        BEYOND  - If Y is entered, another scan is permitted
      C        REWIND  - If Y is entered, tape is rewound and another scan is
      C                  permitted
      C
      C     REMARKS
      C        None
      C
      C     LIBRARIES REQUIRED
      C        REDLIB,MACLIB
      C
      C     METHOD
      C        The program scans the trailer data of the tape starting at START.
      C        If the value of RHO is greater than RHOMIN or the change in RHO
      C        is greater than DIFMIN, then the statistics are summed (and
      C        printed if requested).
      C
0002        COMMON /MTBLK/ IDNSTY,IPARTY,ISTATU(12)
0003        DIMENSION IWKSPC(2730),IMPONG(2730)
0004        COMMON /TRAILY/ IMPING(2580),FVELOC,FAZIMF,FVEVAR,FAZVAR,IFSTAT,
           (FMU(4),FPSI(4),FRHO(6),IFMAX(4),IFMIN(4),FFSPQX,FRHOVX,FVELOX,
           (FAZIMX,FVEVAX,FAZVAX,TVELOC,TAZIMF,TVEVAR,TAZVAR,ITSTAT,TMU(4),
           (TPSI(4),TRHO(6),ITMAX(4),ITMIN(4),FTSPQX,TRHOVX,TVELOX,TAZIMX,
           (TVEVAX,TAZVAX
0005        DIMENSION TMAXT(4),TMINT(4),TMUT(4),TPSIT(4),TSIGMT(4)
0006        DIMENSION FMAXT(4),FMINT(4),FMUT(4),FPSIT(4),FSIGMT(4)
0007        DIMENSION IHEADR(20),IHEAD1(20)
0008        DIMENSION FSIGMA(4),TSIGMA(4)
0009        EQUIVALENCE (IMPING(1),IMPONG(1))
```

```
      C
0010        DATA IZERO/0/,FOUR/1HF/,THREE/1HT/,BOTH/1HB/
0011        DATA XNO/1HN/,YES/1HY/,INO/-1/,IYES/1/
0012        DATA IUNIT/00/,IDNSTY/900/,IPARTY/1/,IREV/-1/
      C.....................................................................
      C
      C     Program and mag tape initialization area.
      C
0013   100  TYPE 10
0014        TYPE 193
0015        ACCEPT 19,JYEAR
      C
0016   102  CALL MTINIT(IUNIT)
0017        IF (ISTATU(1) .NE. IYES) STOP
      C
0019        IGFLAG = INO
0020        TYPE 13
0021        ACCEPT 12,ARRNBR
      C
0022        TYPE 18
0023        ACCEPT 14,RHOMIN
0024        TYPE 171
0025        ACCEPT 14,DIFMIN
0026        TYPE 174
0027        ACCEPT 14,VELMIN
0028        TYPE 175
0029        ACCEPT 14,VELMAX
0030        IF (VELMAX .EQ. 0.) VELMAX=10000.
      C
0032        TYPE 16
0033        ACCEPT 12,STATS
0034        TYPE 182
0035        ACCEPT 19,NRCHNL
0036        INRDIF = 6
0037        IF (NRCHNL .EQ. 0) NRCHNL = 4
0039        IF (NRCHNL .EQ. 3) INRDIF = 3
0041        FNRDIF = FLOAT(INRDIF)
      C
0042        MCONT=0
0043        MCOUNT=0
0044        DO 110 I=1,NRCHNL
0045        FMAXT(I)=0.
0046        FMINT(I)=0.
0047        FMUT(I)=0.
0048        FPSIT(I)=0.
0049        FSIGMT(I)=0.
0050        TMAXT(I)=0.
0051        TMINT(I)=0.
0052        TMUT(I)=0.
0053        TPSIT(I)=0.
0054        TSIGMT(I)=0.
0055   110  CONTINUE
      C.....................................................................
      C
```

```
      C     Tape read area
      C
0056   200  TYPE 190
0057        ACCEPT 19,ISTART,ISTOP
0058        IF (ISTART .EQ. 0) ISTART = 1
0060        IF (ISTOP .EQ. 0) ISTOP = 10000
0062        ISTOP = ISTOP + 1
      C
0063        DO 243,I = 2581,2730
0064   243  IMPING(I)=0
      C
0065   209  IF (IGFLAG .EQ. IYES) GO TO 201
0067        CALL REDTAP(IUNIT,IMPING,INRBYT,ISTATU)
0068        IF (ISTATU(1) .EQ. IYES) GO TO 205
0070        CALL MTSTAT(IUNIT)
0071        IF (ISTATU(8) .EQ. IYES) GO TO 208
0073        GO TO 209
      C
0074   205  IF (IMPING(2) .EQ. ISTART) GO TO 220
0076        IFWD = ISTART - IMPING(2)
0077        IFWD = IFWD - 1
0078        IF (IFWD .EQ. 0) GO TO 209
0080        CALL SPCTAP (IUNIT,IFWD,ISTATU)
0081        IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0083        GO TO 209
      C
0084   220  IF (IMPING(2) .LE. ISTOP) GO TO 204
      C
0086   208  PAUSE ' ***DONE***'
0087   203  IHEADR(2) = 0
0088        IHEAD1(2) = 0
      C
0089        TYPE 151
0090        ACCEPT 12, BEYOND
0091        IF (BEYOND .EQ. YES) GO TO 110
0093        TYPE 15
0094        ACCEPT 12, REWIND
0095        IF (REWIND .NE. YES) GO TO 700
0097        CALL REWTAP (IUNIT,ISTATU)
0098        IF (ISTATU(1) .EQ. INO) CALL MTSTAT(IUNIT)
0100        GO TO 110
      C
0101   204  CALL REDTAP(IUNIT,IWKSPC,INRBYT,ISTATU)
0102        IF (ISTATU(1) .EQ. IYES) GO TO 211
0104        CALL MTSTAT(IUNIT)
0105        IF (ISTATU(8) .EQ. IYES) GO TO 208
0107        GO TO 204
      C
0108   211  IF (IWKSPC(2) .NE. IMPING(2)) GO TO 214
0110        IF (IWKSPC(4) .NE. IMPING(4)) GO TO 214
      C
0112   201  DO 217,I = 1,2730
0113   217  IMPING(I) = IWKSPC(I)
0114        IGFLAG = INO
```

```
0115          GO TO 204
      C
0116    214   IGFLAG = IYES
0117          IF (IMPING(2) .GT. ISTOP) GO TO 208
      C.....................................................................
      C
      C       Tape block setup area
      C
0119    300   DO 301,I = 1,20
0120          IHEADR(I) = IHEAD1(I)
0121    301   IHEAD1(I) = IMPING(I)
      C
0122          DO 304,I = 1,NRCHNL
0123          FSIGMA(I) = FPSI(I)**2 - FMU(I)**2
0124          IF (FSIGMA(I) .LT. 0.) FSIGMA(I) = 0.
0126    304   FSIGMA(I) = SQRT(FSIGMA(I))
      C
0127          DO 303,I = 1,NRCHNL
0128          TSIGMA(I) = TPSI(I)**2 - TMU(I)**2
0129          IF (TSIGMA(I) .LT. 0.) TSIGMA(I) = 0.
0131    303   TSIGMA(I) = SQRT(TSIGMA(I))
      C
0132          FRHOVG = 0.
0133          TRHOVG = 0.
0134          DO 305,I = 1,INRDIF
0135          FRHOVG = FRHOVG + FRHO(I)
0136    305   TRHOVG = TRHOVG + TRHO(I)
0137          TRHOVG = TRHOVG/FNRDIF
0138          FRHOVG = FRHOVG/FNRDIF
0139          TRODIF = TRHOVX - TRHOVG
0140          FRODIF = FRHOVX - FRHOVG
      C
0141          IF (IHEADR(2) .GE. ISTART) GO TO 600
0143          GO TO 209
      C.....................................................................
      C
      C       T array signal detection area
      C
0144    600   IF (TRHOVG .GE. RHOMIN) GO TO 623
0146          IF (TRHOVX .GE. RHOMIN) GO TO 623
0148          IF (FRHOVG .GE. RHOMIN) GO TO 623
0150          IF (FRHOVX .GE. RHOMIN) GO TO 623
0152          IF (TRODIF .GE. DIFMIN) GO TO 623
0154          IF (FRODIF .GE. DIFMIN) GO TO 623
0156          GO TO 209
      C
0157    623   IIBKNR = IHEADR(2)
0158          JDAY = IHEADR(3)
0159          JHOUR = IHEADR(4)
0160          JSEC = IHEADR(5)
0161          IERRTO = IHEADR(17)
0162          IZERON = IHEADR(18)
0163          IOVRNG = IHEADR(19)
0164          IUNDRN = IHEADR(20)
```

```
      C
0165          JFLAG = IZERO
0166          CALL RTCLOK (JFLAG,AMONTH,JDAY,JHOUR,JMIN,JSEC)
0167          IPFLAG = INO
0168          IEFLAG = INO
      C
0169          IF (ARRNBR .EQ. FOUR) GO TO 605
0171          IF ((TRHOVG .GE. RHOMIN).OR.(TRODIF.GE.DIFMIN)) GO TO 609
0173          IF (TRHOVX .LT. RHOMIN) GO TO 605
0175          GO TO 604
0176    609   IF (ITSTAT - 0) 604,663,606
0177    606   IF (TRHOVG.GE.RHOMIN) GO TO 604
0179    663   IF (TRODIF.LT.DIFMIN) GO TO 604
0181          IF (TVELOX .LT. VELMIN) GO TO 605
0183          IF (TVELOX .GT. VELMAX) GO TO 605
      C
0185    604   IF (STATS .NE. YES) GO TO 610
0187          IEFLAG = IYES
0188          PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC,
             &     IIBKNR,IERRTO,IZERON,IOVRNG,IUNDRN
0189          IPFLAG = IYES
0190          PRINT 181,THREE,TRHO
0191          DO 611,I = 1,NRCHNL
0192          III=I+3
0193    611   PRINT 185,III,ITMAX(I),ITMIN(I),TMU(I),TPSI(I),TSIGMA(I)
      C
0194    610   IF ((TRHOVX .LT. RHOMIN).AND.(TRODIF.LT.DIFMIN)) GO TO 605
0196          IF (FTSPQX - 0.) 605,605,614
      C
0197    614   IF (TVELOX .LT. VELMIN) GO TO 605
0199          IF (TVELOX .GT. VELMAX) GO TO 605
0201          DO 630 I=1,NRCHNL
0202          TMAXT(I)=TMAXT(I)+FLOAT(ITMAX(I))
0203          TMINT(I)=TMINT(I)+FLOAT(ITMIN(I))
0204          TMUT(I)=TMUT(I)+TMU(I)
0205          TPSIT(I)=TPSIT(I)+TPSI(I)
0206          TSIGMT(I)=TSIGMT(I)+TSIGMA(I)
0207    630   CONTINUE
0208          KOUNT = KOUNT + 1
      C
0209    605   IF (ARRNBR .EQ. THREE) GO TO 209
      C.....................................................................
      C
      C     F array signal detection area
      C
0211    603   IDUM = IHEADR(2) - 3
0212          IF ((FRHOVG .GE. RHOMIN).OR.(FRODIF.GE.DIFMIN)) GO TO 621
0214          IF (FRHOVX .LT. RHOMIN) GO TO 209
0216          GO TO 602
0217    621   IF (IFSTAT - 0) 602,664,608
0218    608   IF (FRHOVG.GE.RHOMIN) GO TO 602
0220    664   IF (FRODIF.LT.DIFMIN) GO TO 602
0222          IF (FVELOX .LT. VELMIN) GO TO 209
0224          IF (FVELOX .GT. VELMAX) GO TO 209
```

```
      C
0226   602  IF (STATS .NE. YES) GO TO 615
0228        IF (IEFLAG .EQ. IYES) GO TO 632
0230        PRINT 198,JDAY,AMONTH,JYEAR,JHOUR,JMIN,JSEC,
           &    IIBKNR,IERRTO,IZERON,IOVRNG,IUNDRN
0231        IEFLAG = IYES
0232   632  PRINT 181,FOUR,FRHO
0233        DO 616,I = 1,NRCHNL
0234        III=I-1
0235   616  PRINT 185,III,IFMAX(I),IFMIN(I),FMU(I),FPSI(I),FSIGMA(I)
      C
0236   615  IF ((FRHOVX .LT. RHOMIN).AND.(FRODIF.LT.DIFMIN)) GO TO 209
0238        IF (FFSPQX - 0.) 209,209,619
      C
0239   619  IF (FVELOX .LT. VELMIN) GO TO 209
0241        IF (FVELOX .GT. VELMAX) GO TO 209
0243        DO 645 I=1,NRCHNL
0244        FMAXT(I)=FMAXT(I)+FLOAT(IFMAX(I))
0245        FMINT(I)=FMINT(I)+FLOAT(IFMIN(I))
0246        FMUT(I)=FMUT(I)+FMU(I)
0247        FPSIT(I)=FPSIT(I)+FPSI(I)
0248        FSIGMT(I)=FSIGMT(I)+FSIGMA(I)
0249   645  CONTINUE
0250        KUONT = KUONT + 1
0251        GO TO 209
      C
0252   700  IF (ARRNBR .EQ. FOUR) GO TO 702
0254        PRINT 188,THREE,KOUNT
0255        COUNT=FLOAT(KOUNT)
0256        DO 701 I=1,NRCHNL
0257        TMAXT(I)=TMAXT(I)/COUNT
0258        TMINT(I)=TMINT(I)/COUNT
0259        TMUT(I)=TMUT(I)/COUNT
0260        TPSIT(I)=TPSIT(I)/COUNT
0261        TSIGMT(I)=TSIGMT(I)/COUNT
0262        KTMAX=IFIX(TMAXT(I))
0263        KTMIN=IFIX(TMINT(I))
0264        PRINT 195,THREE,KTMAX,KTMIN,TMUT(I),TPSIT(I),TSIGMT(I)
0265   701  CONTINUE
0266   702  IF (ARRNBR .EQ. THREE) GO TO 500
0268        PRINT 188,FOUR,KUONT
0269        CUONT=FLOAT(KUONT)
0270        DO 703 I=1,NRCHNL
0271        FMAXT(I)=FMAXT(I)/CUONT
0272        FMINT(I)=FMINT(I)/CUONT
0273        FMUT(I)=FMUT(I)/CUONT
0274        FPSIT(I)=FPSIT(I)/CUONT
0275        FSIGMT(I)=FSIGMT(I)/CUONT
0276        KFMAX=IFIX(FMAXT(I))
0277        KFMIN=IFIX(FMINT(I))
0278        PRINT 195,FOUR,KFMAX,KFMIN,FMUT(I),FPSIT(I),FSIGMT(I)
0279   703  CONTINUE
      C.....................................................................
      C
```

```
      C     FORMATs area
      C
0280    10  FORMAT (/,' STATS Rev 4.2')
0281    12  FORMAT (A1)
0282    13  FORMAT (' F,T or B? ',$)
0283    14  FORMAT (F6.2)
0284    15  FORMAT (' Rewind tape ?  <otherwise EXIT!> ',$)
0285    151 FORMAT (' Continue in this file on tape? ',$)
0286    16  FORMAT (' Statistics? ',$)
0287    171 FORMAT (' Minimum CHANGE IN RHO? ',$)
0288    174 FORMAT (' VELMIN? ',$)
0289    175 FORMAT (' VELMAX? ',$)
0290    18  FORMAT (' Minimum RHO? ',$)
0291    181 FORMAT (1X,A1,6F5.2)
0292    182 FORMAT (' Number of channels? ',$)
0293    185 FORMAT (1X,I1,2I6,3F5.0)
0294    188 FORMAT (' AVERAGE VALUES OF ',A1,'-ARRAY STATISTICS FOR ',
           &            I4,' BLOCKS')
0295    19  FORMAT (2I6)
0296    190 FORMAT (' Start,Stop: ',$)
0297    193 FORMAT (' Year? ',$)
0298    198 FORMAT (1X,I2,A3,I2,I4,':',I2,' ',I2,'"UT',' BK',I4,4I6)
      C.....................................................................
      C
0299   500  CALL EXIT
0300        END
```

END

3-87

DTIC